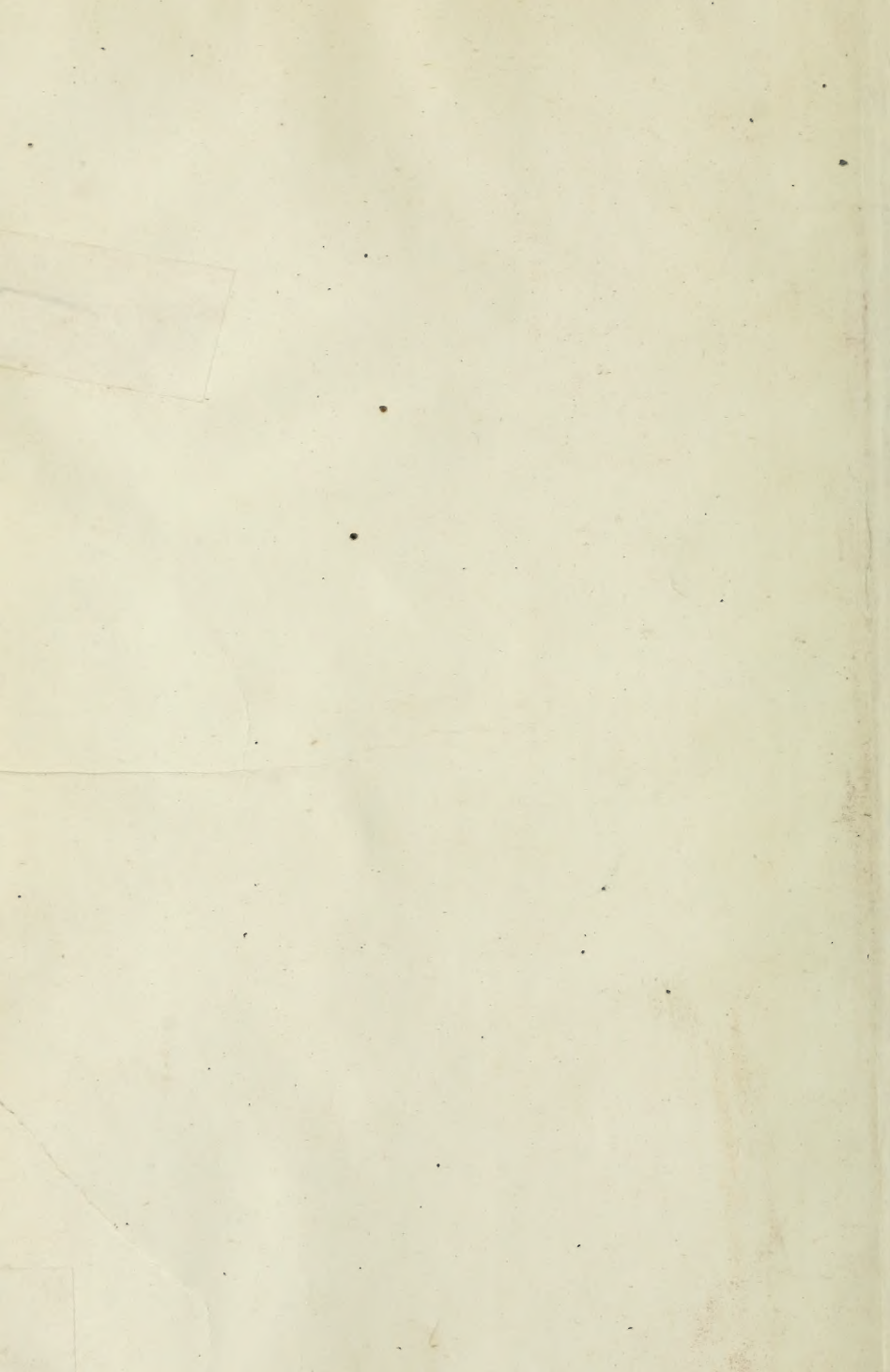



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The
Canadian Entomologist

VOLUME XXVIII.



PRIONUS IMBRICORNIS.

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PORT HOPE, ONTARIO.

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Dr. James Fletcher and W. H. Harrington, Ottawa ;
H. H. Lyman, Montreal, and Rev. T.
W. Fyles, South Quebec.

London, Ont.:

The London Printing and Lithographing Company, Limited.

1896.

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23.7.56



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WILLIAM H. EDWARDS.

The Canadian Entomologist.

VOL. XXVIII.

LONDON, JANUARY, 1896.

No. 1.

WILLIAM H. EDWARDS.

Our readers will all, we are sure, be glad to receive with the first number of a new volume of the CANADIAN ENTOMOLOGIST the accompanying excellent portrait of the well-known and now venerable Entomologist, Mr. W. H. EDWARDS, of Coalburgh, West Virginia. His life-long work has been the study of Diurnal Lepidoptera, and the results of that work are splendidly set forth in the beautifully illustrated volumes of his "Butterflies of North America." In April, 1868, the first part was issued, and at once commended itself to entomologists everywhere by the exquisite beauty and finish of the plates and their faithfulness to nature. In July, 1872, the first Series, forming a large quarto volume with fifty plates, was completed. The second Series, containing fifty-one plates, was begun in May, 1874, but not finished until November, 1884, the less frequent issue of the parts being more than compensated for by the increased value of both plates and letterpress. When the work was begun, as Mr. Edwards stated in his preface, little or nothing was known of the eggs, larvæ or chrysalids of any except the commonest butterflies, and accordingly his first volume illustrated only the perfect state. In 1870 he made the notable discovery that eggs could be satisfactorily obtained by confining the female butterfly of any species with the growing food-plant of its larva, and at once began the study of the life-histories of a number of species previously known only in the imago state. The results of these studies are admirably set forth in the letterpress as well as in the plates of the second and third Series; on these are accurately depicted eggs and larvæ in their different stages, as well as chrysalids and imagoes. Many wonderful discoveries have been made during these investigations, among the first being that of the seasonal trimorphism of *Papilio Ajax*, and the dimorphism of *Grapta Interrogationis*; and of *G. Comma*. The process of breeding was soon taken up by Mr. Edwards's friends and correspondents all over North America, and, aided by the general extension of railways over the Continent, he was able to get eggs of butterflies from widely distant localities,

and to follow them successfully through all their stages. Thanks to his efforts, the reproach of ignorance of the preparatory states of our butterflies has been removed, and though much remains to be learnt, vast progress has already been made. The first part of the third Series was issued in December, 1886, and in October last we had the pleasure of welcoming the sixteenth. Far from showing any decline from the Author's high standard of excellence, this last issue may justly be regarded as the climax of good work, both on the part of the writer and the artist. All through Mr. Edwards has been fortunate in having his wishes so ably carried out by his artist-assistants, Mrs. Mary Peart, of Philadelphia, who has drawn most accurately nearly all the plates, and, in order to do so satisfactorily, has reared most of the caterpillars, and Mrs. Lydia Bowen, who has so exquisitely performed the work of colouring.

In addition to the great work that we have just referred to, Mr. Edwards has contributed largely to the periodical literature of science, especially to the Proceedings and Transactions of the American Entomological Society and the CANADIAN ENTOMOLOGIST. His first contribution to our pages was published in the third number of our first volume, in 1868, and he has continued to favour us with articles of great value ever since; his last paper, in the September number of Volume XXVII., being the one hundred and sixty-eighth which he has written for our journal.

Mr. Edwards was born on the 15th of March, 1822, and will soon complete his seventy-fourth year. That he may long be spared in health and prosperity to carry on his excellent work is the cordial wish of the writer and all his friends.

C. J. S. B.

THE "BOMBYCES": WHAT ARE THEY?

BY HARRISON G. DYAR, PH. D., NEW YORK.

It might be better to say "what were they?" in an article addressed to readers of to-day, since the name in its old sense will not be found in the most recent writings of Packard, Comstock, Chapman, Grote, and other authors. However, the group is adopted in our latest check-list (Nos. 877-1459), although without its name, Prof. Smith stating that he could not limit the group to his satisfaction. Also, as recently as 1893, Dr. Packard published an "Attempt at a new classification of the Bombyces," including in the group all the families formerly included, but altering their sequence. Following the arrangement of suborders pro-

posed by Prof. Comstock, and the division into superfamilies which I have suggested and which Mr. Grote has adopted with improved nomenclature*, let us see where the families of "Bombyces" fall.

From the JUGATÆ, we find the Hepialidæ only, the most highly specialized Jugates in respect to the abortion of the mouth parts. From the FRENATÆ as follows:—

Superfamily Tineides.—The Eucleidæ, Megalopygidæ, Anthroceridæ and Pyromorphidæ from the apex of development along the main stem; the Psychidæ, Lacosomidæ and Heterogynidæ, side branches, but all specialized (the much specialized Sesiidæ went with the Sphingidæ), and finally the Cossidæ, a low type, but of large size.

Superfamily Agrotides.—All the families, except those called Zygænidæ, the Agrotidæ and Geometridæ, the two latter (with the exception of the Notodontidæ) the lowest types in the superfamily.

Superfamily Bombycides.—The whole group.

Superfamily Sphingides.—None, this group being recognized as distinct, although the Sesiidæ and Thyridæ were associated with it.

Superfamily Papilionides.—None.

Thus it will be seen that the Bombyces consisted of the higher types in all lines of development, regardless of relationship. If we imagine the genealogical tree of Lepidoptera as growing upright from the ground, the several branches and twigs representing the families and being of length proportional to their degree of specialization, the old classification would be represented by *horizontal* planes. The uppermost would cut off the very summit of the tree, the Papilionides; the next would take the next succeeding top branches, perhaps the Sphingides, and the tip of a side branch from the Tineid trunk, say the Sesiidæ. The next cut might give the old Zygænidæ, consisting of some families from the Agrotid and Tineid trunks, and the fourth cut is our Bombyces, taking branches of all the trunks that are approximately equal in degree of specialization. The base of the tree would comprise the rest of our old familiar families, the Noctuidæ, Micros, etc.

It is the aim of more recent work to follow the lines of genealogy, a classification cutting our imaginary tree in *vertical* planes, including in each group all families related to each other in the same line of descent, regardless of degree of specialization.

*Syst. Lep. Hildesie, 1895.

CONCERNING FELTIA, AND OTHER MATTERS.

BY JOHN B. SMITH, SC. D.

The question asked by Mr. Slingerland in his very interesting paper in the CAN. ENT., XXVII, p. 301, is in great part answered by himself. I think he shows very conclusively that *subgothica*, Haw., is correctly used for our American species, and has given us a very full statement of the evidence upon which he bases his conclusions, thus removing the matter from the domain of unsupported opinion. From the nature of the case, and in the absence of Haworth's actual type specimen, the proof cannot be absolute; but until something more definite is supplied, I think the conclusions of the paper on the identity of *subgothica*, must be accepted. As to the synonymy, I think Mr. Slingerland is also correct. I have not found the A. O. U. Code clear on this matter, though it is as to genera in the same case; but, after consulting Dr. C. Hart Merriam, a recognized authority on questions of nomenclature, I am assured that Guenée's name *jaculifera* must sink as a synonym. On this, the main features of the paper, I accept all of Mr. Slingerland's conclusions; but I was a little surprised to find him defending genitalic characters as possibly good for generic divisions, in the apparent belief that I had used these characters as a basis for my division of the mass of species I found lumped as *Agrotis*! I believe that, with the possible exception of Mr. Scudder, no one in America has studied the genitalia of more insects of all orders than I. Certainly no one has figured more, and no one has insisted more strongly upon the value of these characters for specific distinction. I have examined in some cases over one hundred specimens of a single species without discovering appreciable variation, and while I was engaged in the study of *Lachnosterna* I examined nearly 2,000 specimens of the *fusca* group alone, for these characters. Yet, while insisting on their specific value, I have also pointed out that while easily distinguished species often have very similar genitalic structures, very closely allied species—superficially—may have them utterly unlike. Nowhere have I ever claimed that genitalic characters afford good bases for genera; on the contrary, I am distinctly of the opinion that they should not be used except in very special cases. The only instance where I have yet found it desirable to make use of them as a sole character, is in the series of species which I have called *Porosagrotis*. That is an expediency genus, and stated as such, with the reasons for it,

Yet, somehow, the idea seems to be current that all my work, in *Agrotis* at least, is based on genitalic characters only! Mr. Dyar, in a book notice, CAN. ENT., XXVII., 225, says: "Under *Agrotis* the *genitalic divisions** of Prof. Smith are given subgeneric value only, a proceeding which commends itself to the present reviewer." So Mr. Slingerland, on pp. 306 and 307 of the paper already cited, accepts this as a correct statement, and voices a doubt as to the value of such a basis. I was interested enough to write Mr. Slingerland on the subject, and he frankly acknowledged in return: "Yes; I simply followed Grote and Dyar in my statements regarding your divisions of the genus *Agrotis*." And Mr. Dyar, I have no doubt, simply followed Mr. Grote! Now, I would not be understood as questioning for a moment the divine right of a critic to condemn without reading or understanding the work criticised, or to impute views to suit himself; but I must confess that I am inclined to have more regard for comments when the criticism indicates an understanding of the author's actual position. But perhaps this is merely a prejudice on my part!

Yet it is something of a surprise that Mr. Grote's statements concerning my work or views should find unquestioned acceptance anywhere. When any of my papers are under his consideration, condemnation is nearly always certain, and Mr. Grote is always a much-abused individual. If the facts do not bear out the desired conclusion, why so much the worse for the facts. For instance, we find in the CAN. ENT. for 1894, Vol. XXVI., pp. 82 and 83, the following plaint:—"Prof. Smith goes still further. He suppresses my reference of the species described by Moeschler as *islandica* to *opipara*, in 1892, as cited above, and has the courage to write, 'the error is Mr. Grote's for condemning Mr. Morrison's species on insufficient grounds!' By also suppressing Moeschler's original determination, I am brought in for a synonym I never committed!" If reference is made to my Revision of *Agrotis*, Bulletin No. 38, U. S. Nat. Mus., p. 183, the following will be found: "Mr. Grote was correct in referring *opipara* and *islandica*, Moeschl. (nec Stgr.), as synonymous. The error is Moeschler's in failing to recognize the distinction between the forms, and Mr. Grote's for so positively condemning Mr. Morrison's species on insufficient grounds." How much now remains of Mr. Grote's complaint? If the curious reader will take the trouble to look into the

*The italics are mine. Note the plural. Mr. Grote uses *all* my divisions as subgenera,

literature of the subject, I think he will find Mr. Grote's criticisms on Mr. Morrison's writings and on the species described by him, at least severe enough to justify my statement.

So I am charged with ignoring Mr. Grote's work, and of failing to give him due credit. He writes (Abh. des. n-w Ver. zu Bremen, XIV., p. 16 of separate), after quoting my statement of the bases for subdividing *Agrotis*: "This is only a restatement of my original recommendation. As a matter of fact, throughout Smith merely applies rigorously the structural characters pointed out *by me* long before, and which I lacked time and material to ascertain in the case of each species. In this same paper I say: 'Subdivisions of the genus can be undertaken when the form of the genitalia is studied. This character, taken in connection with the antennal structure, will give us subgenera and assist in the identification of our numerous species.' This is precisely what Smith gives us after a lapse of seven years, and without making proper mention of *my initiatory* work. *He follows my lead as if I had not pointed out the way.*"* Mr. Grote is quite right in the statement that I gave him no credit for the characters used by me, and this is simply because they were not in any sense of the word original with him. Lederer used them in his work on the European Noctuids, so long ago as 1857, and so many other writers, antedating Mr. Grote, used them, that they long since became common or universal knowledge. I made no claim to originality in their use, and concede none to Mr. Grote. I made a bald statement of the characters employed; nothing more. I do claim originality, however, for the use of the claspers instead of the side-pieces (harpes) alone. Lederer used the latter only, and Mr. Grote nowhere went further than Lederer.

Mr. Slingerland questions also whether we shall use *Feltia* or *Agronoma*, because Mr. Grote asserts that the two are synonyms and the latter, with *vestigialis* as type, antedates *Feltia*. Mr. Slingerland failed to find material in Mr. Grote's writings to determine the matter and, quite correctly, does not accept his bald statement as decisive. I gave in my Revision (p. 109), under *Feltia*, the following: "The distinctive characters of the species grouped under the present term are, spinose and quite heavily armed fore tibiæ; protuberant, rough front, pectinated or serrate antennæ, usually wide wings with dark colours and a tendency to

*The italics are mine.

a radiate type of maculation." Mr. Grote, writing from Europe, of a common European species, presumably had specimens at hand for examination, and to the scientific student it would seem as if a clinching argument could be presented in the simple statement that *vestigialis* presented just these structural characters. But except for a reference to the maculation, such a statement is carefully avoided! It may be added, indeed, that in nearly every case where Mr. Grote has replaced a generic name proposed by me by an "earlier" term, he gives no structural characters to sustain his point. It is loose assertion merely. I found in the Martindale collection at the Ac. Nat. Sci. of Philadelphia, a good pair of *vestigialis*; through the courtesy of Mr. E. L. Graef, of Brooklyn, N. Y., I obtained another pair; and from the U. S. National Museum I obtained two additional males, by the kindness of the officials in charge. I compared these carefully with the descriptions of the species accessible to me, that no reasonable doubt might exist as to their identity and then found, as I had expected from Mr. Grote's silence, that there is no protuberant, rough front, and there are no heavily armed fore tibiae! The species belongs to *Agrotis* as restricted by me. If, as Mr. Grote states, *vestigialis* is the type of *Agronoma*, this name can never replace *Feltia*, with *ducens* (*subgothica*) as type, whether we use it in a generic or sub-generic sense. I have absolutely no prejudice in favour of any of the generic names adopted or proposed by me, and am ready to suppress any or all of them in favour of others previously used. I ask only that there shall be a scientific demonstration of their identity; not merely a loose statement without facts given to support it. Lepidopterists have been too long looked upon as triflers rather than as students, because of this very lack of scientific accuracy in their work; but I am happy to say that to the more recent writers, including the Messrs. Slingerland and Dyar, this reproach cannot be made. With the beginning of a Scientific study, structural characters are discovered in all stages that upset our previous notions, and the classification of the order is therefore in an unsettled condition. I believe that it will remain so for some time to come; but every accurate contribution adds clearness, and while their novelty may induce the placing of too much stress upon newly discovered facts, they will, eventually, be fitted into their proper places.

Now, concerning the term *Noctuide* which Mr. Grote proposes to replace by *Agrotide*! He says: "The family name *Agrotide* is proposed instead of the usual term *Noctuide* since the generic title *Noctua*

is preoccupied" (Abh. Naturw. Ver. Brem., XIV., p. 1 of separate), and again (l. c., p. 21): "The term *Noctua*, used by authors for this section, is, as I understand the matter, preoccupied in the Birds and, according to the rules, cannot be used a second time in Zoology." Again no facts are given, and again Mr. Dyar repeats, CAN. ENT., XXVII., 225, "The name *Agrotidæ* is proposed for the customary *Noctuidæ*, as the term *Noctua* is preoccupied in Birds." Mr. Dyar thus seems to accept the change and repeats, as a fact, Mr. Grote's positive statement that the name is preoccupied. It may be so; these gentlemen may have information not accessible to me, and in order to bring it out I state my own knowledge as follows:—

In Scudder's "Nomenclator" we find

Noctua, Klein, Moll., 1753,

Noctua, Fabr., Lep., 1776,

Noctua, Say., Aves., 1809,

Noctuæ, Linn., Lep., 1758.

In the Century Dictionary, that marvellous storehouse of terms, the same order is observed: (*a*) an old genus of Mollusca, Klein, 1751; the date here differing from Scudder; (*b*) a genus in Lepidoptera, and (*c*) a genus of Owls by Savigny in 1809.

I cannot find in any dictionary of Ornithology any earlier use of the term *Noctua*, though this of course does not prove that there is none.

Noctua, Klein, 1751 or 1753, is certainly the earliest use of the term; but here we run up against the following:

"Canon XII.—The Law of Priority begins to be operative at the beginning of Zoological nomenclature."

"Canon XIII.—Zoological nomenclature begins at 1758, the date of the Xth edition of the 'Systema Naturæ' of Linnæus."

We find that the term *Noctuæ* was used for the Lepidoptera in the very publication with which Zoological nomenclature begins, although *Noctua* as a generic term in the order is to be credited to Fabricius.

It is possible, of course, that some publications exist, which were overlooked by the authorities cited by me; but if this is so, Mr. Grote certainly owes it to Zoological Science at large to refer to them, and to give the reasons for rejecting *Noctua* as a term "preoccupied in the Birds."

LIST OF HYMENOPTERA TAKEN AT SUDBURY, ONT.

BY JOHN D. EVANS, TRENTON, ONT.

In the following list 283 species are enumerated, 34 not determined specifically, and there are 8 species unknown, making a total of 325 species. I am much indebted to Mr. W. H. Harrington for his very great kindness and valued assistance in identifying these insects.

Collecting was also done in some of the other orders, viz.: Diptera, Orthoptera, and Neuroptera; more especially in the first mentioned, in which many fine specimens were taken, and await determination:—

<i>Cimbex americana</i> , <i>Leach</i> .	<i>Strongylogaster longulus</i> , <i>Nort</i> .
=var. 10-maculata, <i>Leach</i> .	" <i>pinguis</i> , <i>Nort</i> .
<i>Trichiosoma triangulum</i> , <i>Kirby</i> .	" <i>soriculatus</i> , <i>Prov</i> .
<i>Hylotoma clavicornis</i> , <i>Fab</i> .	" <i>terminalis</i> , <i>Say</i> .
" <i>McLeayi</i> , <i>Leach</i> .	<i>Pæcilostoma albosecta</i> , <i>Prov</i> .
" <i>scapularis</i> , <i>Klug</i> .	<i>Tenthredo mutans</i> , <i>Nort</i> .
<i>Priophorus æqualis</i> , <i>Nort</i> .	" <i>rufipes</i> , <i>Say</i> .
<i>Nematus aureopectus</i> , <i>Nort</i> .	" <i>semirubra</i> , <i>Nort</i> .
" <i>inquilinus</i> , <i>Walsh</i> .	" <i>signata</i> , <i>Nort</i> .
" <i>lateralis</i> , <i>Nort</i> .	" <i>verticalis</i> , <i>Say</i> .
" <i>luteotergum</i> , <i>Nort</i> .	<i>Tenthredopsis delta</i> , <i>Prov</i> .
" <i>malacus</i> , <i>Nort</i> .	" <i>Evansii</i> , <i>Hargtn</i> .
" <i>placentus</i> , <i>Nort</i> .	<i>Lophyrus abietis</i> , <i>Harr</i> .
" <i>rufocinctus</i> , <i>Hargtn</i> .	" <i>Lecontei</i> , <i>Fitch</i> .
" <i>ventricosus</i> , <i>Klug</i> .	<i>Lyda fascipennis</i> , <i>Cress</i> .
" <i>violaceipennis</i> , <i>Nort</i> .	" <i>pallimacula</i> , <i>Nort</i> .
<i>Harpiphorus maculatus</i> , <i>Nort</i> .	<i>Oryssus Sayi</i> , var. <i>affinis</i> , <i>Harr</i> .
<i>Dolerus aprilus</i> , <i>Nort</i> .	<i>Xiphydria Provencheri</i> , <i>Cress</i> .
" <i>arvensis</i> , <i>Say</i> .	<i>Urocera albicornis</i> , <i>Fab</i> .
" <i>bicolor</i> , <i>Beauv</i> .	" <i>caudatus</i> , <i>Cress</i> .
" <i>sericeus</i> , <i>Say</i> .	" <i>cyaneus</i> , <i>Fabr</i> .
<i>Monophadnus rubi</i> , <i>Harr</i> .	" <i>flavicornis</i> , <i>Fabr</i> .
<i>Macrophya albomaculata</i> , <i>Nort</i> .	" <i>nigricornis</i> , <i>Fabr</i> .
" <i>epinota</i> , <i>Say</i> .	<i>Figites impatiens</i> , <i>Say</i> .
" <i>flavicoxæ</i> , <i>Nort</i> .	<i>Aulacus rufitarsis</i> , <i>Cress</i> .
" <i>trisyllaba</i> , <i>Nort</i> .	<i>Fœnus incertus</i> , <i>Cress</i> .
<i>Pachyprotasis omega</i> , <i>Nort</i> .	" <i>tarsatorius</i> , <i>Say</i> .
<i>Taxonus</i> , <i>Sp</i> .	<i>Ichneumon brevipennis</i> , <i>Cress</i> .

<i>Ichneumon canadensis</i> , <i>Cress.</i>	<i>Phygadeuon rotundiceps</i> , <i>Prov.</i>
" <i>cincticornis</i> , <i>Cress.</i>	" <i>rubrocinctus</i> , <i>Prov.</i>
" <i>cœruleus</i> , <i>Cress.</i>	" <i>sp.</i>
" <i>comes</i> , <i>Cress.</i>	" <i>sp.</i>
" <i>comptus</i> , <i>Say.</i>	<i>Cryptus extrematis</i> , <i>Cress.</i>
" <i>duplicatus</i> , <i>Say.</i>	" <i>robustus</i> , <i>Cress.</i>
" <i>grandis</i> , <i>Brullé.</i>	" <i>rufoannulatus</i> , <i>Prov.</i>
" <i>Grotei</i> , <i>Cress.</i>	" <i>n. sp.</i>
" <i>inconstans</i> , <i>Cress.</i>	<i>Linoceras Cloutieri</i> , <i>Prov.</i>
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" <i>navus</i> , <i>Say.</i>	" <i>macrurum</i> , <i>Linn.</i>
" <i>nuncius</i> , <i>Cress.</i>	" <i>purgatum</i> , <i>Say.</i>
" <i>parvus</i> , <i>Cress.</i>	<i>Exochilum nigrum</i> , <i>Prov.</i>
" <i>rubicundus</i> , <i>Cress.</i>	" <i>occidentale</i> , <i>Cress.</i>
" <i>rufiventris</i> , <i>Brullé.</i>	<i>Anomalon anale</i> , <i>Say.</i>
" <i>similaris</i> , <i>Prov.</i>	" <i>semirufum</i> , <i>Nort.</i>
" <i>subcyaneus</i> , <i>Cress.</i>	<i>Opheltes glaucopterus</i> , <i>Linn.</i>
" <i>trizonatus</i> , <i>Prov.</i>	<i>Paniscus albovariegatus</i> , <i>Prov.</i>
" <i>vecors</i> , <i>Cress.</i>	" <i>geminatus</i> , <i>Say.</i>
" <i>versabilis</i> , <i>Cress.</i>	<i>Campoplex diversus</i> , <i>Nort.</i>
" <i>sp.</i>	" <i>laticinctus</i> , <i>Cress.</i>
" <i>n. sp.</i>	" <i>vicinus</i> , <i>Prov.</i>
<i>Amblyteles expunctus</i> , <i>Cress.</i>	" <i>alius</i> , <i>Nort.</i>
" <i>nubivagus</i> , <i>Cress.</i>	" <i>sp.</i>
" <i>ormenus</i> , <i>Cress.</i>	<i>Limneria Guignardi</i> , <i>Prov.</i>
" <i>stadaconensis</i> , <i>Prov.</i>	" <i>parva</i> , <i>Prov.</i>
" <i>subrufus</i> , <i>Cress.</i>	" <i>rufipes</i> , <i>Prov.</i>
" <i>suturalis</i> , <i>Say.</i>	" <i>sp.</i>
<i>Phæogenes orbus</i> , <i>Prov.</i>	" <i>sp.</i>
" <i>tuberculifer</i> , <i>Prov.</i>	" <i>sp.</i>
<i>Ischnocerus</i> ? <i>sp.</i>	" <i>n. sp.</i>
<i>Nematopodius</i> , <i>sp.</i>	<i>Pyracmon macrocephalum</i> , <i>Prov.</i>
<i>Phygadeuon acaudus</i> , <i>Prov.</i>	<i>Mesochorus</i> , <i>sp.</i>
" <i>indistinctus</i> , <i>Prov.</i>	<i>Exetastes rufofemoratus</i> , <i>Prov.</i>
" <i>fusiformis</i> , <i>Prov.</i>	" <i>sp.</i>
" <i>jocosus</i> , <i>Prov.</i>	<i>Banchus borealis</i> , <i>Cress.</i>
" <i>nitidulus</i> , <i>Prov.</i>	" <i>canadensis</i> , <i>Cress.</i>

- Banchus flavescens*, *Cress.*
 " *flavovariegatus*, *Prov.*
Mesoleptus canaliculatus, *Prov.*
 " *sp.*
 " *sp.*
Megastylus, n. sp.
Mesoleius submarginatus, *Cress.*
 " *sp.*
Tryphon americanus, *Cress.*
 " *pediculatus*, *Prov.*
 " *seminiger*, *Cress.*
Euceros Couperii, *Cr.*
Polyblastus annulipes, *Cress.*
Cteniscus clypeatus, *Cress.*
Exyston clavatus, *Cress.*
Exochoides borealis, *Cress.*
Exochus atrocoxalis, *Cress.*
 " *lævis*, *Cress.*
Bassus orbitalis, *Cress.*
 " *pulchripes*, *Prov.*
Coleocentrus Pettitii, *Cress.*
Arotes formosus, *Cress.* var.
Rhyssa persuasoria, *Linn.*
Thalessa atrata, *Fab.*
Ephialtes gigas, *Walsh.*
 " *pygmæus*, *Walsh.*
 " *tuberculatus*, *Four.*
Pimpla conquisitor, *Say.*
 " *4-cingulata*, *Prov.*
 " *inquisitor*, *Say.*
 " *novita*, *Cress.*
 " *Ontario*, *Cress.*
 " *pedalis*, *Cress.*
 " *tenuicornis*, *Cress.*
 " *sp.*
Polysphincta texana, *Cress.*
 " *sp.*
Cylloceria occidentalis, *Cress.*
- Lampronota americana*, *Cress.*
 " *parva*, *Cress.*
 " *punctulata*, *Cress.*
 " *varia*, *Cress.*
 " *sp.*
Meniscus scutellaris, *Cress.*
Phytodietus vulgaris, *Cress.*
Euxorides americanus, *Cress.*
Xylonomus stigmapterus, *Say.*
 " *canadensis*, *Hargtn.*
Odontomerus mellipes, *Say.*
 " *canadensis*, *Prov.*
 " *n. sp.*
Echthrus abdominalis, *Cress.*
 " *niger*, *Cress.*
 " *rufopedibus*, *Hargtn.*
Bracon dissitus, *Cress.*
 " *obliquus*, *Prov.*
 " *n. sp.*
Rhogas abdominalis, *Cress.*
 " *terminalis*, *Cress.*
Apanteles cinctus, *Prov.*
Agathis liberator, *Brullé.*
Microdus annulipes, *Cress.*
Meteorus vulgaris, *Cress.*
Gymnoscelus pedalis, *Cress.*
Macrocentrus mellipes, *Prov.*
Leucospis affinis, *Say.*
Eurytoma auriceps, *Walsh.*
Isosoma, sp.
Monodontomerus montivagus,
 Ashm.
Perisemus prolongatus, *Prov.*
Proctotrypes rufigaster, *Prov.*
 " *longiceps*, *Ashm.*
Pteromalina, sp.
Platygaster aphidis, *Ashm.*
Cleptes insperata, *Aaron.*

- Omalus læviventris*, *Cress.*
Hedychrum violaceum, *Brullé.*
Chrysis hilaris, *Dahlb.*
Camponotus herculeanus, *Linn.*,
 var. pictus, *Foul.*
Camponotus marginatus, *Latr.*
Formica sanguinea, *Latr.*
Myrmica, *sp.*
Sapyga maculata, *Prov.*
 " *Martini*, *Smith.*
Pompilus albosignatus, *Prov.*
 " *cylindricus*, *Cress.*
 " *hyacinthinus*, *Cress.*
 " *marginatus*, *Say.*
 " *maurus*, *Cress.*
 " *philadelphicus*, *Cress.*
 " *virginiensis*, *Cress.*
 " *sp.*
Agenia pulchripennis, *Cress.*
Prionemis alienatus, *Smith.*
Ceropales fraterna, *Smith.*
Ammophila communis, *Cress.*
 " *luctuosa*, *Smith.*
 " *vulgaris*, *Cress.*
Sphex apicalis, *Harr.*
Astata unicolor, *Say.*
Hoplisus atricornis, *Pack.*
 " *ephippiatus*, *Pack.*
 " *phaleratus*, *Say.*
Cerceris nigrescens, *Smith.*
Mimesa basirufa, *Pack.*
Cemonus inornatus, *Say.*
Pemphredon concolor, *Say.*
Passalæcus mandibularis, *Cress.*
Trypoxylon frigidum, *Smith.*
Crabro ater, *Cress.*
 " *chrysarginus*, *St. Farg.*
 " *cubiceps*, *Pack.*
Crabro interruptus, *St. Farg.*
 " *maculipennis*, *Fabr.*
 " *oblongus*, *Pack.*
 " *producticollis*, *Pack.*
 " *sex-maculatus*, *Say.*
 " *villosifrons*, *Pack.*
 " *sp.*
Thyreopus advenus, *Smith.*
 " *coloradensis*, *Pack.*
 " *latipes*, *Smith.*
Eumenes fraternus, *Say.*
Odynerus albomarginatus, *Sauss.*
 " *albophaleratus*, *Sauss.*
 " *canadensis*, *Sauss.*
 " *capra*, *Sauss.*
 " *catskillensis*, *Sauss.*
 " *debilis*, *Sauss.*
 " *leucomelas*, *Sauss.*
 " *philadelphiae*, *Sauss.*
Polistes pallipes, *Lepell.*
Vespa maculata, *Fab.*
 " *scelesta*, *McFarland.*
 " *vulgaris*, *Linn.*
 " *sp.*
Colletes americana, *Cress.*
Prosopis affinis, *Smith.*
 " *basalis*, *Smith.*
Sphecodes dichroa, *Smith.*
 " *falcifer*, *Patton.*
Halictus albitarsis, *Cress.*
 " *constrictus*, *Prov.*
 " *coriaceus*, *Smith.*
 " *ligatus*, *Say.*
 " *pilosus*, *Smith.*
 " *scabrosus*, *Prov.*
 " *sp.*
 " *sp.*
 " *sp.*

<i>Augochlora purus</i> , Say.	<i>Megachile consimilis</i> , Cress. ?
<i>Andrena frigida</i> , Smith.	" <i>grandis</i> , Cress.
" <i>hirticeps</i> , Smith.	" <i>melanophæa</i> , Smith.
" <i>nivalis</i> , Smith.	" <i>optiva</i> , Cress.
" <i>vicina</i> , Smith.	" <i>pugnata</i> , Say.
" sp.	" <i>simplex</i> , Prov.
<i>Calliopsis æstivalis</i> , Prov.	<i>Melissodes rustica</i> , Say.
<i>Nomada americana</i> , Kirby.	<i>Anthophora bomboides</i> , Kirby.
<i>Epeolus mercatus</i> , Fab.	<i>Clisodon terminalis</i> , Cress.
<i>Coelioxys alternata</i> , Say ?	<i>Apathus Ashtoni</i> , Cress.
" <i>tristis</i> , Cress. ?	<i>Bombus borealis</i> , Kirby.
<i>Osmia buconis</i> , Say.	" <i>consimilis</i> , Cress.
" <i>bucephala</i> , Cress.	" <i>fervidus</i> , Fab.
" <i>frigida</i> , Smith.	" <i>lacustris</i> , Cress. ?
" <i>lignaria</i> , Say.	" <i>ternarius</i> , Say.
" <i>simillima</i> , Smith.	" <i>terricola</i> , Kirby.
<i>Monumetha borealis</i> , Cress.	" <i>virginicus</i> , Linn.
<i>Anthidium simile</i> , Cress.	

THE MEDITERRANEAN FLOUR MOTH, EPHESTIA KUEHNIELLA, ZELLER, STILL IN CANADA.

The determined and energetic fight carried on by the miller, the entomologist, and the Local Government in 1889, to stamp out this destructive mill pest in Ontario, is too fresh in the memory of those who witnessed that outbreak to warrant a repetition of the particulars. Suffice it to say that the flour moth is still very abundant in certain Canadian mills. I have received it recently in flour sent me direct from a milling firm in Valleyfield, Quebec, with an urgent appeal for help. The mill has been obliged to shut down several times during the present year to clean out the enormous accumulations of matted flour and webs in the spouts and elevator legs. The mill is a new one and has been running a very short time. It is said the pest came from a neighboring firm. My experience with this moth in California and other places convinces me that it is the worst pest millers have to combat, and this note should be a signal warning to all those interested in the milling business. I have also recently discovered the same pest in Southwestern New York State, where it has done considerable mischief this year, and is still spreading. It has occasioned much loss on the Pacific Coast also the present season. If something is not done to arrest and destroy this advancing enemy in the United States and Canada, I predict very serious results to the milling industries of both countries.

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ASPIDIOTUS PERNICIOSUS, COMSTOCK, AND AONIDIA FUSCA,
MASKELL: A QUESTION OF IDENTITY OR VARIATION.

BY W. M. MASKELL, WELLINGTON, NEW ZEALAND.

In the "Report of the Entomologist of the United States Department of Agriculture for the year 1880," Professor Comstock described (p. 304) an extremely injurious insect of the family Coccidæ, to which he gave the name *ASPIDIOTUS PERNICIOSUS*, or "the pernicious scale," and he stated that this insect attacked a very large number of deciduous fruit-trees in California, "excepting peach, apricot, and black tartarean cherry." Later, this pest was observed, described and discussed by many persons interested in horticulture, and in America it is generally known by the trivial name of "the San José scale," and is looked on as a most troublesome thing.

An article in "Insect Life," Vol. VI., No. 5, September, 1894, contains much information relative to this insect, and its occurrence in various places in America since 1880. Here and there the scale appears to have been found on peach, but only in small quantity; the principal victims are pear, plum, Japanese plum, apple, currant, etc., and most especially pear. In a subsequent article ("Insect Life," Vol. VII., No. 2, p. 165) the same trees are mentioned, with the addition of Japanese quince, and elm (American?). Again, in the same publication (Vol. VII., p. 285) the pear is given as the chief victim of this scale.

In the Agricultural Gazette, of New South Wales, September, 1892, p. 698, Mr. A. S. Olliff reports *ASP. PERNICIOSUS* in Australia on pear.

In September, 1894, I received from Mr. French, of Melbourne, some twigs of peach trees thickly covered with a scale which, in my paper on Coccidæ (read November, 1894; published in Transac. New Zealand Institute, Vol. XXVII.), I identified as belonging to the genus *AONIDIA*, and named *AON. FUSCA*.

In March, 1895, the same gentleman sent me some apple twigs with many scales, which I found to be *ASPIDIOTUS PERNICIOSUS*.

Finally, in July, 1895, Mr. Olliff sent me twigs of pear, peach, and apple, from New South Wales, much infested by *ASPIDIOTUS PERNICIOSUS*.

It was whilst examining these last specimens that the characters which I observed in the adult females led me to compare them closely with those of *AONIDIA FUSCA*, and, as a result, I cannot help being considerably perplexed.

The opinion which, for many years past, I have persistently advocated, as regards the study of Coccidæ, is that it is always better to base distinctions, where possible, upon anatomical characters of the insects themselves, rather than upon external features of the coverings, waxy or cottony, or otherwise, under which they are sheltered. These coverings may vary so much according to accidental circumstances that I think they should be considered as of secondary, or even less, importance. In the case of the two insects of which I am now treating, I am sorry to say that I did not adhere strictly enough to my own rule. Size, colour, form of the scale, food-plant, and such like things, have been so greatly insisted upon, as I find, in all the accounts of *ASPIDIOTUS PERNICIOSUS*, that I have perhaps attached too much importance to them, and, consequently, it is possible that my identification of *AONIDIA FUSCA* is erroneous.

All the authors who describe *ASP. PERNICIOSUS* give the following characters of it :—

1. The scale is "gray"; the pellicles "yellow or reddish-yellow," "sometimes black."
2. When on twigs, "the wood beneath the bark is stained red"; "the cambium layer of wood is stained purplish"; the "peculiar reddening effect on the skin is a very characteristic feature"; "the cambium layer frequently becomes deep red or purplish"; "if the twig be scraped with the finger-nail, a yellowish oily liquid will appear."
3. The diameter of the female puparium, or scale, is given by Comstock as about one 13th inch. I do not find it in other writers.
4. The principal food-plant, as mentioned above, is the pear; when the peach is mentioned it is only incidentally, or as very slightly attacked.
5. No mention is made by authors of the second female pellicle as being any larger than the adult female.

Now, in all the foregoing characters, the specimens on which I founded my *AONIDIA FUSCA* differ from *ASP. PERNICIOSUS*; and if one might accept as positively final the statement in "Insect Live" (Vol. VIII., p. 289), that "the San José scale differs from all others in the peculiar reddening effect which it produces," then there would be no more to be said; for *AONIDIA FUSCA* produces, as far as I know, no such effect. In size, *A. FUSCA* is much smaller, the female puparium having a diameter of one 35th inch. In colour it is "very dark brown or dull black ;

and again. *A. FUSCA* is decidedly numerous on peach twigs. Lastly, the second female pellicle is larger than the adult insect.

Judging, therefore, by all the external characters (except that of the second pellicle, of which I find no record), *AONIDIA FUSCA* is different from *ASPIDIOTUS PERNICIOSUS*.

But a careful comparison of the adult female insects shows that, with the exception of size, their characters are very similar. My specimens of *ASP. PERNICIOSUS* (originally received from Professor Comstock) average one 25th inch in length : those of *AON. FUSCA* average one 65th inch.

In colour the two agree ; also in the absence of any groups of "spinnerets" ; also in the terminal lobes, hairs, and indentations of the abdomen. The two last characters are of especial importance ; so much so that I am strongly inclined to think that I made a mistake in separating the two insects, at least specifically. The identity of my Australian specimens of *ASPID. PERNICIOSUS* with those from America is absolute ; my Australian *AONIDIA* is anatomically very close to both, the principal differences being external.

It remains to discuss the generic character of the comparative dimensions of the adult female and the second pellicle, a character which distinguishes *AONIDIA* from *ASPIDIOTUS*. I have already remarked that I find no notice on this point in any author as to *A. PERNICIOSUS* ; but as regards *A. FUSCA* I have no doubt, and I possess a mounted specimen of an adult with the second pellicle still attached, the difference in size being perfectly clear : the pellicle extends all round beyond the adult. Assuming, therefore, that it may be necessary to unite the two insects, and to make *FUSCA* a variety of *PERNICIOSUS* on the ground of anatomical similarity, ignoring the external differences, it will become a question, then, of removing *PERNICIOSUS* from the genus *ASPIDIOTUS* and of attaching it to the genus *AONIDIA*.

It is stated in "Insect Life," Vol. VI., p. 362, that while the origin of *A. PERNICIOSUS* is uncertain, the probability is that it came to America from Japan. I believe that Mr. Koebele is in Japan at present studying the Coccidæ of that country ; and he has, perhaps, discovered the native home of this injurious pest. But, in a letter which I received from him a few months ago, he says that the Japanese will not permit any specimens of insects to be sent thence by post ; and we must wait till Mr. Koebele himself leaves the country to learn more about this scale. Mr. Benson, of Sydney, however, tells me there have been many fruit trees imported into Australia of late years from Japan.

ON AGROTIS TRITICI, LINN., AB. SUBGOTHICA, HAW., AND
AGROTIS JACULIFERA, GN.

BY J. W. TUTT, F. E. S., LONDON, ENGLAND.

I have read with interest the paper by Mr. Slingerland, CAN. ENT., XXVII., p.p. 301-308, and as my name is occasionally mentioned, I trust to the courtesy of our Editor to allow me to reply.

In the first place, I would premise by suggesting that Mr. Grote had more than the bare statement of mine quoted by Mr. Slingerland on p. 302, and was not guided by that alone. He had, I presume, at least seen my notes in the *Entomologists' Record*, and in *British Noctue and Their Varieties*, Vol. II. These Mr. Slingerland appears to have overlooked.

I would point out to American readers that Haworth called his book *Lepidoptera Britannica*, that he described no species knowingly that were not British, and that the onus of proving that he did so rests on Mr. Slingerland, and those who think with him. I would point out also that although Mr. Grote and Prof. Smith may not "have ever seen the original description of *subgothica*," yet I can assure Mr. Slingerland that I had, and that as Mr. Grote, according to his letter, based "his recent revision on the authority of Mr. Tutt," it matters little whether Mr. Grote saw it or not, for he shifts the onus upon my shoulders.

With regard to the species in dispute, I would refer your readers to the quotation referring to the species Haworth described (*vide*, ante, p. 302), in which Haworth says of the species "Habitat in Anglia valde infrequens."* Now, Mr. Slingerland has to face this point. The American species does not occur in England; the species Haworth describes does occur in England; therefore the species that Haworth describes cannot possibly be the American species, by any laws of logic I know.

As Mr. Slingerland says, "No figure of the insect is given"; therefore the whole value of Haworth's name rests on his description. The first question, it seems to me, is not, "Is there anything in it that does not apply to our American insect?" for thus far we have not come to the possibility of its being American, but rather, "Is there any British insect to which it applies absolutely?" and I say, yes! most decidedly, yes! and the insect to which it applies is one of the endless forms of *Agrotis tritici*.

*This was written in 1810, and Mr. Slingerland does not suggest the possible introduction of American specimens into England until 20 years later.—J. W. T.

Mr. Slingerland evidently does not know our British *Agrotis tritici*; it is outside my brief to go into the protean forms it exhibits, but when I say that my series comprises some 2,500 specimens, which have received something like twenty-five different specific names, and a mere summary of these occupies 15 p.p. in *The British Noctue and Their Varieties*, your readers will see that Mr. Slingerland is treading on treacherous grounds when he is dealing with the subject, and suggests that British lepidopterists cannot name their own insects, for this is undoubtedly the ultimate conclusion of his line of argument.

Now, it is quite evident from Mr. Slingerland's remarks (p.p. 302-303) that whatever specimens Haworth (before 1810) described his *subgothica* from, Mr. Stephens (1829) did not describe the same specimens, for he described his from specimens obtained from Mr. Raddon, and the specimens were labelled, "near Barnstaple, Devon." Now, I have to add, as a matter of personal knowledge, that the coasts near Barnstaple, Devon, produce *A. tritici* in immense numbers, and I can assure Mr. Slingerland, and all other American entomologists, that I can match exactly the specimens which Stephens figures, and Humphrey and Westwood copy, with undoubted genuine specimens of *Agrotis tritici*, and I quite agree with my friend, Mr. C. G. Barrett, that these figures certainly represent a variety of *tritici*.

We now come to Mr. Slingerland's first move into the mists of probability, and I would suggest to Mr. Slingerland that probability is not critical science. I refer to Wood's figure, reproduced in the plate, fig. 1b. Mr. Slingerland says:—"I think that a glance at the next figure of the insect that appeared, taken, doubtless, from Stephens's specimen,* will remove all doubt as to what insect Stephens tried to represent." I object absolutely to this premise. There is not a scintilla of evidence to warrant such an assertion. We want facts and deductions therefrom. We do not now, three-quarters of a century after publication, want an assertion made as being "doubtless," without a single fact to support it.

Now, "up to 1847," Mr. Slingerland very rightly observes that English Entomologists considered *subgothica* a British insect, and a distinct species. Then Mr. Doubleday stated that "Haworth's insect is evidently simply a variety of either *Agrotis tritici* or *aquilina*. The species described by Stephens is American." Now, it is strange that I had never noticed this reference before, but it fortifies my position. It

*I have referred to this statement in detail farther on.

must be observed that Doubleday was the authoritative link binding the "Stephens" generation with the present, and his independent opinion alone would not have to be lightly passed over. My own conclusion being at one with his as to *subgothica*. Haw., I take as affording one more link in the strong chain of independent evidence that I have been able to collect. On p. 305, Mr. Slingerland says:—"Curiously enough" (had I been he I should have said 'naturally enough'), "the English authors have claimed Haworth's insect as a variety of their *tritici*. Doubleday said it was 'simply a variety of either *tritici* or *aquilina*,' but it was soon restricted to the former in British lists, and it is still considered as such by Mr. Tutt." In Doubleday's time, *Agrotis tritici* and *A. aquilina* were considered as distinct species, but for the last thirty or forty years it has been well known that *aquilina* is simply a local form of *tritici*, and that the two erstwhile supposed species copulate indiscriminately*. The Continental (European) and British Entomologists have long ago deprived it of specific rank. Therefore, Mr. Doubleday's conclusion and mine are identical.

Mr. Slingerland says that "the evidence in support of considering Haworth's *subgothica* as a variety of *tritici* (or *aquilina*) seems to be confined principally to the simple statement of Doubleday, although Tutt intimates that he has seen Haworth's description." This is really too ingenuous. Haworth's *Lepidoptera Britannica* was the hand book of British Lepidoptera, and in the hands of every British collector until the publication of Stainton's *Manual* in 1858. Every British collector had his "Haworth" then, just as everyone has his "Stainton" now, and I can only hope that this statement will be sufficient to brush out any doubtful remnants of the implied suggestion contained in this remarkable paragraph.

I am totally unable to untangle the line of thought in which Mr. Slingerland has got on p. 303 when he writes:—"For many years after this the name *subgothica* rarely appeared in British lists, and only as a variety of *tritici*; it apparently does not occur at all in recent lists. It has never been taken in England, so far as I can find any record since Stephens's time." Evidently, when our leading lepidopterists had worked out the true position of Haworth's *subgothica*, it would disappear

*For purposes of sale British collectors still keep them separate, and some conservative lepidopterists, who believe nothing they do not see themselves, even write of them as being so.—J. W. T.,

from the British lists, for, from that time forth, it ceased to exist as a distinct species, and became naturally a synonym of the older name of the same species *tritici*, Linn., unless the list contained varietal names as well as specific, when *subgothica*, Haw., would naturally fall as a variety of *tritici*, Linn. To say that *subgothica*, Haw., has "never been taken in England since Stephens's time" is absurd, and begging the whole question. for dozens are taken every year (from my point of view), whereas if Mr. Slingerland refers to Guenée *jaculifera*. it, of course, never has been taken in England, neither in Stephens's time, before his time, or "since his time."

We come now to the first introduction of the species into American literature, the year 1856, Mr. Slingerland informs us, and then Dr. Fitch applied to an American species the name *subgothica*, Haw. On what grounds Dr. Fitch did this we cannot tell: evidently he did not know of Doubleday's conclusion in 1847, but I will say this—that the general similarity between some examples of the two species, and the small amount of systematic work which had been done in the American *Noctuae* in 1856, are more than enough to excuse Dr. Fitch for supposing they were identical; nor do I think that Mr. Slingerland scores a point when he states that "no American writer has seriously questioned the identity of our species with the *subgothica* of Stephens and later English writers, or even with the *subgothica* of Haworth until 1891, when Mr. Grote changed his mind in accordance with the opinion of Mr. Tutt." Can Mr. Slingerland wonder at this? What American entomologist had the slightest knowledge of our British *Noctua*? I will go farther and ask—What American *has*? And now I will execute a bouleversement and ask—What British entomologist knows anything of American *Noctuae*? You may answer, Mr. Walker and Mr. Butler; but Mr. Walker's ignorance was notorious, and the present condition of the *Noctuae* in the British Museum is sufficient proof that Mr. Butler cannot name the commonest British species. The whole thing is too absurd. The name was never questioned, because there was no one to question it.

Now we come to Doubleday's statement *re* "the species described and figured by Stephens is American," and his explanation that he had "traced all the specimens which he had seen of this species (the one described by Stephens) in collections of British Lepidoptera to one source, and I believe the gentleman who distributed them inadvertently mixed a number of the North American insects with his British ones,"

and goes on with a statement that is utterly damaging to "the gentleman's" veracity, or as to his consummate carelessness; but still the unexplained factor remains, viz., that forms of *A. tritici* identical with that figured by Stephens are in many British collections, that the locality given by Raddon is a *bona fide* one for *A. tritici*, and that at a time when there were fewer collectors and few specimens the form figured may not have been well known to Mr. Doubleday.

Now, let us grant for a moment that the variation of *A. tritici* and *A. jaculifera*, Gn., is so closely parallel; nay, so identical, that two specialists at this group, as I suppose Mr. Slingerland and myself to be, cannot see any difference in certain figures claimed for both species—in other words, that what I have no hesitation in referring to *A. tritici*, he has no hesitation in referring to *A. jaculifera*. What bearing, I would ask, has that on Haworth's description? Haworth was dead, and his work was published years before, and he could have had none of Raddon's specimens. He described, evidently, from perfectly different specimens from those used by Stephens. Therefore, even if Raddon fraudulently deceived Stephens, it is clear that he did not deceive Haworth, and until Mr. Slingerland can show some more definite facts relative to Haworth's *subgothica*, he must excuse us if we refuse to change an opinion held by successive generations of British entomologists, viz., that *subgothica*, Haw., is what Haworth described it as, and verily believed it to be, a British and not an American species, and which no one supposed it to be until Dr. Fitch's introduction of the name in America, for, be it observed, the doubt thrown by Doubleday was not on *subgothica*, Haw., but *subgothica*, Stephens. Mr. Slingerland now touches upon what he evidently considers the clinching part of his argument. He asks: "Is Haworth's *subgothica* the same as Stephens's. Probably Haworth's single type specimen could not now be found, if it exists at all." Mr. Slingerland can take the latter for granted. Haworth's type specimen would have been found years ago were it findable. That being so, we are told we must "depend on the original description and a little circumstantial evidence to settle this point." I have before stated that Doubleday and all British authors for almost a century have known perfectly well that Haworth's description refers to a well-known form of *Agrotis tritici*, and the evidence is in favour of this view, but the "circumstantial evidence" must be examined carefully. Mr. Slingerland says that "Haworth's specimen might easily be one which Mr. Barrett recently found in an old

English collection, made up of specimens obtained from older collections by a Mr. Burney, who was contemporary with—and corresponded with—Haworth and others, and many of whose insects fell into his hands.” Now, Haworth died about 1830; Burney died in 1893, aged 79 years. At the time of Haworth’s death, therefore, Burney was a boy of 16, and his correspondence (if any) with Haworth must have been of the most casual character. Again, Haworth’s insects were sold, and Burney would have remembered had he bought it; but boys of 16 do not, as a rule, affect sale-rooms, and at this time Burney was a boy at school. It is on Haworth’s sale catalogue, Mr. Slingerland says, so Haworth did not give it to Burney as a result of correspondence. Now we come to “the specimen” mentioned by Mr. Barrett. I also saw the specimen—one of the American *jaculifera*. It had no label, no hint of its origin, and it was present with dozens of other *foreign* specimens, with not the slightest claim to be considered British. Two years ago Mr. Burney’s collection was sold. That collection was a marvel. It had been collected just as some men collect “old pots” or “toothpicks.” Everything buyable had been bought, and in England, as elsewhere, you can buy anything if you will only pay enough. There were dozens—nay, hundreds of foreign specimens that he had paid big prices for, and obtained with them a British warranty; many of the insects bore well-known lepidopterists’ names—some bore my own. So gross was the fraud, that I disowned some of the latter in the sale-rooms. The whole collection was a scientific lie from beginning to end, and among the foreign specimens sold—it was not even labelled or suggested as British—was this American specimen of *jaculifera*. What Mr. Dale surmises is quite beside the question; there are hundreds of people in England who can guess—more, perhaps, in America—and when Mr. Dale ventures, without the slightest shred of evidence, to suppose that it “probably came from Mr. Raddon,” his wild guess made of people who lived and died before he was born, helps to cut away the ground from under Mr. Slingerland’s feet, for even if every assumption be made that this was a specimen introduced into Britain with a fraudulent design in 1829 (the date of Stephens’s *Illustrations*), it could not have been the specimen that Haworth described anterior to 1810; and these are the facts on which Mr. Slingerland “believes that the weight of evidence indicates that the *subgothica* of Haworth and Stephens were the same species.” I would only ask, Is this logic, or is it science! if not—what is it?

For a scientific man, Mr. Slingerland must be easily satisfied ; but I would urge again that guesswork is not science. I maintain that Haworth's description of *subgothica* refers word for word to a certain form of *Agrotis tritici*. I maintain that Mr. Slingerland has not brought forward one scintilla of evidence to upset Haworth's statement that his species has its "habitat in Anglia ; I maintain that Mr. Slingerland has not brought forward the ghost of a fact to assume that *subgothica*, Haw., is or is not even identical with *subgothica*, Steph.

With regard to the latter, I must assume that Mr. Slingerland has had at least as much experience with the various forms of *Agrotis jaculifera* as I have had with those of *Agrotis tritici*, and, therefore, that his opinion is as good as mine ; but I still maintain mine, he will maintain his.

Now we come to a matter of expediency. Is it worth while to perpetuate a name about which so much doubt exists? Suppose Mr. Slingerland and myself let our difference die a natural death, the same duel will be fought again and again between our successors, who will view the matter from our respective standpoints.

Now, about Guenée's figure (1d) there can be no doubt. It does not represent any possible form of *Agrotis tritici*. Here, then, is the first unquestioned figure of the American insect. It is the only reasonable name to apply to it, but that is a matter for Mr. Grote and Prof. Smith, and not for me. I simply state facts. *Agrotis tritici*, var. *subgothica*, Haw., is a living fact to me, so is *Agrotis jaculifera*, Gn. For my part I shall continue to write :—

Agrotis tritici, Linn.

ab. *subgothica*, Haw.

2. *Agrotis jaculifera*, Gn.

And Mr. Slingerland can add, if he chooses, to the latter (? *subgothica*, St.). This is what facts warrant, and when we change facts for opinion we are doing a sorry thing for science.

Mr. Slingerland says, p. 303 : " This figure, which is reproduced as 1b on the plate [it is enlarged to natural size], is from Wood's *Index Entomologicus*, pl. 9, fig. 149 (1839). All must admit that it is one of the best figures of our American species ever published." I have compared it carefully with the figure from nature, and mark the differences : Wood's figure (1b) may be the best of the figures of the American species ever published, but it represents equally well many specimens of *A. tritici* in my cabinet, and the question arises how far we are justified in considering these as two distinct species at all ; whilst for two male specimens of the

same species the abdomina are singularly unlike. Indeed, Mr. Slingerland's references to the figures seem remarkably unhappy, for if Wood's figure is one of the best figures of the American insect ever published, it is singularly unlike the figure from nature above it, and to suppose that Wood's figure (1b) and Stephens's (1a) are from the same specimen seems to suggest great incapacity on the part of one of the artists to reproduce what he saw. Figs. 1 and 1d represent nothing British, but for the remainder there is nothing to add.

I would now draw Mr. Slingerland's attention to an important fact that he has altogether overlooked, viz., the connection between Doubleday and Guenée. It is a matter of history that almost all the N. American species Guenée possessed were obtained from Doubleday and Desvignes, and that most of his work was submitted to Doubleday before publication. It was, therefore, with Doubleday's full knowledge that *jaculifera* was described, and I observe that Guenée in his *Histoire, etc. (Noctuelites)*, Vol. V., p. 262, actually described his *jaculifera*, var. B., from specimens in Doubleday's collection. It is quite evident that with the mutual understanding between Doubleday and Guenée, that Doubleday agreed with Guenée's nomenclature of the American species in 1852, and equally certain, in the face of what he had written in 1847, that he considered the species quite distinct from *subgothica*, Haw.

Mr. Slingerland, in his quotation of my note that "I do not know the American *subgothica*," rather misstates my present position. I have examined all the specimens in the British museum repeatedly since 1891, and know well what I am talking about, and his suggestion that I am an "English writer, who does not know the American insect," is rather startling and far-fetched, and would have been more warranted had Mr. Slingerland written his article five years ago.

One other point only interests me in the note, and in that I am pleased to be able to agree with Mr. Slingerland. There is no doubt Guenée's name, *jaculifera*, refers to the insect known as such, that his var. B. must be called *tricosa*. Lintner, and that his var. B. = *herilis*, Grote. It may be interesting as bearing out Mr. Slingerland's position that Guenée probably had no specimens of *jaculifera*, but that he described Desvignes and Doubleday's specimens; that these Entomologists must have had several specimens is pretty evident, for Guenée writes (*Ibid.*, p. 262): "Amérique Septentrionale; Canada Coll. Div. Parait très-commune; whilst of var. B. he specially notes: "Etat de New-Yorck, Coll., Dbday."

I have tried to be explicit even at the risk of offending our Editor by being too verbose. I am afraid even now that I may have to explain doubtful points. At any rate I trust I have been logical enough to convince my two good friends, Prof. Grote and Prof. Smith, that on the score of "scientific truth," as well as on the score of "expediency," it is not well that two distinct species should be known in Europe and America by the same name, and that the true name henceforth for the American species—much as I detest upsetting old associations—must be *Agrotis jaculifera*, Gn.

EXOMALOPSIS, A NEOTROPICAL GENUS OF BEES
IN THE UNITED STATES.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

The genus *Exomalopsis*, Spin., was founded in 1851 on a couple of bees from Para, Brazil. Three years later, F. Smith described three additional species, also from Brazil. More recently, species have been described or recorded from Cuba, Jamaica, and Mexico, but none hitherto from the United States. One species, *E. pulchella*, Cr., has a remarkable range, being found in Cuba (Cresson), Jamaica (Fox), and Lower California (Fox). I myself have taken it in Jamaica.

The species now described has rather an extensive range in the upper Sonoran zone of New Mexico.

Exomalopsis solani, n. sp.—♀ about 8 mm. long, anterior wing about 6 mm. Black, polished, very shiny, pubescence all pale. Head broad, subtriangular seen from the front, eyes narrow; occiput and cheeks fringed with pubescence, silvery-grayish and subappressed on cheeks; erect, duller, and subochraceous on occiput. Vertex bare, but the occipital hairs extend forward behind the ocelli. Front with copious white hairs, seeming to radiate from the antennal sockets; clypeus and labrum with rather thin yellowish pubescence. Antennæ black, the last half of the flagellum becoming rufous; 2nd joint of flagellum equal with 3rd, or, if anything, rather shorter. Mandibles black; 4th and 5th joints of maxillary palpi of equal length, 6th shorter. In another specimen the 4th joint is clearly longer than the 5th. Glossa reddish, the tip obtuse.

Thorax with rather dense pubescence, except the scutellum, hind half of mesothorax, and dorsum of metathorax, which are bare. The dorsal pubescence is dull yellowish-gray, with even a few black hairs immediately behind the scutellum and at the sides of the mesothorax; on the hind border of prothorax is some dense short pale pubescence, showing through the longer hairs. At the sides of the metathorax and on the pleura the pubescence is whitish. The exposed portions of the meso- and metathorax are practically impunctate, but the pleura is very strongly punctured. Tegulae large, piceous. Wings smoky-hyaline, stigma and nervures piceous; marginal cell long, pointed; 2nd submarginal not half as big as the 1st or 3rd, a little narrowed above; 3rd submarginal narrowed nearly one-half to marginal. Femora and tibiae black; tarsi rufescent. Pubescence of legs whitish, that of tarsi reddish behind. Tibio-tarsal brush of hind legs very large, the hairs very distinctly plumose,

whitish or dull silky white, not at all gray or black, but rufescent on tarsi beneath. Claws very strongly bifid.

Abdomen short, nearly subglobose; bases of segments with sparse silky pubescence; hind margins of segments 2-4 and sides of hind margin of 1st segment with narrow even bands of pure white pubescence, very conspicuous.

Hab.—First found at Albuquerque, N. M., not uncommon on flowers of *Solanum eleagnifolium* between the old and new towns, Aug. 16, 1895. On Oct. 13 I took one at Las Cruces, N. M., on a plant supposed to be *Flaveria*. Specimens were also taken at Las Cruces by Mr. C. Rhodes, on *Verbesina encelioides* and *Bigelovia Wrightii*, early in October.

Curiously, this insect seems to resemble the West Indian types rather than the Mexican. I sent one to Mr. Fox, who remarks that it "differs from any in our collection by the narrow, continuous, white fasciæ of abdomen, which are more regular than in the related species. From *pulchella* and *similis* it differs by the apparently unicolorous pubescence of hind tibiæ, and again from *similis* by the dorsulum being polished and impunctate medially." The Mexican species nearly all have black pubescence.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

At the annual meeting held in London, on the 27th and 28th of November last, the following gentlemen were elected to hold office during the ensuing year:—

President—J. Dearness, London.

Vice-President—H. H. Lyman, Montreal.

Secretary—W. E. Saunders, London.

Treasurer—J. A. Balkwill, London.

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Editor of the Canadian Entomologist—Rev. C. J. S. Bethune, M.A., D.C.L., Port Hope.

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Committee on Field Days—L. Woolverton, M.D.; Messrs. Sherwood, McClement, Balkwill, Stevenson, Saunders, Anderson, Elliott, Rennie, and Bowman, London.

Auditors—J. H. Bowman and J. M. Denton, London.

The annual subscription (\$1), now due, should be sent to the Treasurer, J. A. Balkwill, Victoria Hall, London, to whose order money orders or drafts should be made payable.

BOOK NOTICES.

A HAND-BOOK OF BRITISH LEPIDOPTERA, by Edward Meyrick, B. A., F.Z.S., F.E.S., assistant master at Marlborough College. London: MacMillan & Co., and New York, 1895

This book of 843 pages, illustrated by 104 cuts of venation, describes all the British species of Lepidoptera, 2,061 in number, with descriptions of the genera, families and superfamilies. Full synoptic tables are given, leading down to the separation of species. For the recognition of species, for which it is intended, the work seems admirably adapted. A brief notice of the larva of each species is given, but not enough for identification. What is said, however, is useful and also serves to indicate those species whose life-history is still imperfectly known. The work on the imagoes is stated to be the result of the author's independent observation, but the larval descriptions are compiled. No species are figured. The nomenclature, especially of the higher groups, is occasionally unsatisfactory. There is no synonymy and no references to literature, so that some of the family names are meaningless till after a careful examination of the species included. Some of the changes seem arbitrary and contrary to the rules of priority; *e. g.*, where the Thyatiridæ are called "Polyplocidæ," and the Eucleidæ (= Limacodidæ), "Heterogeneidæ," without any explanation. The spelling of the family names does not conform to the general present custom. A few new genera are described among the Tineids.

The most original and most interesting part of the book is the classification of the Lepidoptera into superfamilies. It differs from any hitherto presented, but is strictly on the lines laid down by recent workers as reviewed by Mr. Tutt (Trans. Ent. Soc., London, 1895, p. 343). Nine superfamilies are created, the lowest, the "Micropterygina," correspond-

ing exactly to Prof. Comstock's Jugatæ, although not elevated to the rank of a suborder. I reproduce the classification in full, adding, in brackets, certain explanations of the family terms.

1. CARADRININA.

Arctiadae [=Sarrothripus, Cymbidae, Lithosiidae, Nolidæ, and Arctiidae].

Caradrinidae [=Noctuidæ with vein 5 of secondaries weak, and Apatelidae].

Plusiadae [=the other Noctuidæ].

Ocnieriadae [=Lymantriidae and Colocasia (Demas)].

2. NOTODONTINA.

Hydriomenidae }
 Sterrhidae } [= Geometridæ and
 Geometridæ } Brephidae].
 Monocteniidae }

Selidosemidæ }
 Polyplocidae [=Thyatiridae].

Sphingidae

Notodontidae.

Saturniidae.

3. LASIOCAMPINA.

Drepanidae.

Endromidae.

Lasiocampidae.

4. PAPILIONINA.

Nymphalidae.

Satyridae.

Erycinidae.

Lycænidæ.

Pieridae.

Papilionidae.

Hesperidae.

5. PYRALIDINA.

Phycitidae.

Galleriidae.

Crambidae.

Pyraustidae.

Pyralidae.

Pterophoridae.

Orneodidae.

6. PSYCHINA.

Psychidae.

Zeuzeridae [=part of Cossidae].

Zygaenidae [=Authroceridae].

Heterogeneidae [=Eucleidae].

7. TORTRICINA.

Epiblemidæ.

Tortricidae.

Phaloniadae.

Trypanidae [=part of Cossidae].

8. TINEINA.

Aegeriidae [=Sesiidae].

Gelechiidae.

Oecophoridae.

Elachistidae.

Plutellidae.

Tineidae.

9. MICROPTERYGINA.

Hepialidae.

Micropterygidae.

It appears that the superfamilies 5 to 8 correspond to my Tineides, 4 to the Papilionides, 1 to 3 to the Agrotides with the exception of two families under the "Notodontina," the Sphingidae and Saturniidae, which

I consider as of superfamily rank. With the exception of these two unwarranted (as I think) associations, there seems little fault to find with the classification. I will leave to Mr. Grote the correction of the family and superfamily names, as he has paid especial attention to the determination of types, and the effects of the application of priority rules. The importance of such work is made very evident by Mr. Meyrick's book, if we are ever to have a uniform and stable nomenclature.

It is evident now that Lepidopterists are practically agreed on the general classification of the Frenate. As to the exact limits of superfamily groups, there is yet, unfortunately, scarcely an approach toward agreement.

HARRISON G. DYAR.

THE CAMBRIDGE NATURAL HISTORY, Vol. V. *Peripatus*, by Adam Sedgwick, M.A., F.R.S., etc.; Myriapods, by F. G. Sinclair, M.A.; Insects, Part I., by David Sharp, M.A. (Cantab.), M.B. (Edinb.), F.R.S. Macmillan & Co., London; and New York, 1895.

Under this title has been given to the public a work which bears out in every way the deservedly high reputation of the writers. From its style of treatment of the subject, the book may be read with pleasure and profit by general student and specialist alike, while to the instructor who wishes to bring before his pupils the results of late researches, though out of reach of large libraries, it will prove a most valuable aid.

The chapter on *Peripatus*, by Mr. Sedgwick, is in itself a model memoir, and the twenty six pages devoted to the curious creature are made up for the most part of original studies by the author, who has previously published important monographs on this subject. The historical and morphological matter, which is fully illustrated by fine figures, is followed by a synopsis of all the known species, with notes on their differential characters and geographical distribution—the map which forms the frontispiece of the volume showed them to be confined to the region south of the Tropic of Cancer. The discussion of the affinities of *Peripatus* to the Arthropoda and Annelida is of great interest to the zoologist, whatever his beliefs in regard to the theory of descent.

From Mr. F. G. Sinclair we have the chapter on Myriapoda. The preliminary account of these animals contains some charmingly written notices of their habits, and marks the author as a faithful observer in the field as well as in the laboratory. A short sketch of the classification follows, with brief definitions of the families and figures of typical forms,

Several pages which are devoted to the anatomy and embryology of the group, and are embellished by many useful figures, are succeeded by an account of the fossil forms and by a discussion of the zoological position of the class.

Dr. Sharp has taken up the Insecta (Hexapoda) in the third chapter, and nearly five hundred pages are devoted to the general consideration of the subject and a careful review of the Aptera (Thysanura and Collembola) the Orthoptera (inclusive of the Forficulidæ), the Neuroptera (under which name he includes several of the groups given ordinal rank by Brauer, Packard, Comstock, and others) and the lower families of the Hymenoptera. The remainder will follow in future volumes, which the Entomological world will look forward to with much interest. No one who is familiar with the work of the author needs to be assured of its excellence, and it will be sufficient to state that the literary side is fully as well upheld as the scientific. The reader whose knowledge of scientific terms is limited will find that careful attention has been given to making them clear, while the specialist will see that many important points, simply touched upon or slurred over by most text-books and "Natural Histories," are here elaborated by a master hand. The figures of large and bizarre forms of Orthoptera and the accounts in the text of their wonderful adaptation to environment convey a most instructive lesson. A remarkable case of resemblance to an ant is shown by a small Locustid (*Myrmecophana fallax*) which, with a form of body recalling in general that of an ant, is dependent for the "stalk" or pedicel of the abdomen upon a white spot on each side of the body, leaving only a narrow dorsal line dark.

We have not room to speak of all the groups in detail, but mention should be made of the very interesting accounts of the Termites, or white ants. To the inquiring mind, also, the practice of citation of authorities by means of foot-notes must commend itself—this plan being followed throughout the work. The beauty and careful selection of the illustrations deserve special remarks, while the press work is of the best. On the whole, we must consider the enterprise as one meriting the support of every entomologist who cares to see the treatment of his favourites placed in the hands of those competent to properly deal with it and who are able to give us a well-written, thoroughly interesting and reliable guide.

H. F. WICKHAM.

Mailed January 15th, 1896,

The Canadian Entomologist.

VOL. XXVIII. LONDON, FEBRUARY, 1896.

No. 2.

THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XIV. THE MELOIDÆ OF ONTARIO AND QUEBEC.

The Canadian species of Meloidæ are few in number, but offer considerable difficulty to the student, chiefly from the fact that some of them are extremely variable in colour and size, while in the genus *Meloe* we meet with a group in which the specific characters have never been accurately determined. The family is characterized by the vesicant or blistering properties of its members (the "Spanish fly" being perhaps the best known in this connection), and, under the name of cantharides, blister-beetles are to be found in every drug store. To the agriculturist they are often a pest, *Macrobasis unicolor* often doing considerable damage to potatoes. The naturalist finds in the curious modifications of the antennæ of the males, a theme worthy of his careful study.



FIG. 1.—Larva of Blistering Beetle.

The larval habits of but few species have been worked out, and these vary somewhat among themselves. The account of the transformations of some European species of *Meloe* has been so often copied in entomological text books that it seems scarcely necessary to reproduce it here. It may be enough to note that the larvæ are hatched as minute six-footed active creatures, which find their way on to the bodies of bees, and are carried in this way into the nests. Here they feed on the provisions and larvæ of the bees, changing their form several times before appearing as pupæ.

Technically, the family characters may be summed up as follows:—

Hind tarsi 4-jointed, the others 5-jointed; anterior coxal cavities open behind. Head strongly narrowed at base into a small neck, front vertical; lateral suture of prothorax entirely obliterated. The base of the prothorax is narrower than that of the elytra, the hind coxæ are large and promi-

ment, and the claws are either cleft or toothed. The chief development of the group in North America is to be found in the regions lying to the westward of the Missouri River and southward of the Platte. Here the species of *Cantharis* and *Pyrota* abound, and, with representatives of several peculiar genera which are unknown in the Eastern districts, give to the fauna a facies which is unmistakable. Some of these Southwestern forms are of considerable size, *Macrobasis longicollis*, Lec., reaching the length of an inch. while *M. atrivittata* is even larger, and is, besides, of great beauty. *Cysteodemus Wislizeni*, Lec., is remarkable on account of its form—the elytra being convex and inflated, giving a comical appearance of obesity to the insect. In colour it is of a bright blue, and a more curious species in most respects does not exist in our fauna.

The genera reported from Canada may be readily separated by the following table :—

Elytra short, overlapping along the suture and leaving most of the abdomen exposed. Wings absent..... *Meloe*.

Elytra long, almost or quite covering the abdomen, not overlapping at suture. Wings usually present.

Second joint of antennæ as long or longer than the third ; first joint elongate in the male *Macrobasis*.

Second joint of antennæ shorter than the third, usually not more than half as long.

Antennæ not thickened towards the tip, setaceous, usually much longer than the head and thorax. Surface of body not metallic..... *Epicauta*.

Antennæ scarcely longer than the head and thorax, much thickened towards the tip ; the outer joints short and broad.

Labrum deeply emarginate at middle... .. *Pomphopæa*.

Antennæ extending beyond base of thorax, the joints bead-like in form ; labrum slightly emarginate at middle. Surface of body metallic..... *Cantharis*.

It will be understood that the above characters are not of necessity essential, and that they are intended to apply only to the Canadian forms constituting the genera. Several species of *Cantharis* from other regions are not metallic, and there is a great range of variation in the form of the antennæ. This matter is discussed more fully in Dr. Horn's papers, the titles of which may be found in the bibliography.

MELOE, Linn.

A most difficult genus to treat. The species are clumsy insects with short elytra, which do not cover the large, unwieldy abdomen. They may be found crawling about on low herbage during the cooler portions of the day, or sometimes on flowers; apparently they are most common in autumn and spring. When disturbed they emit a disagreeable fluid from the joints.

As one of the species is lacking in our collection, we have applied to Dr. Horn for the synopsis serving to separate the four Canadian forms among themselves.

Thorax evidently longer than wide, sparsely and irregularly punctate.

Elytra rather finely strigose and subopaque; general colour dull blue; head scarcely punctate. *americanus*, Leach.

Thorax not longer than wide.

General colour black, dull; thorax coarsely punctured and with an impression on basal half of median line. *impressus*, Kirby.

Blue-black, slightly shining; thorax moderately densely punctate, disk not impressed; elytra not roughly sculptured. *niger*, Kirby.

Decidedly blue and rather shining; thorax very coarsely, deeply, not densely punctured; disk not impressed; elytra rather coarsely sculptured. *angusticollis*, Say.

MACROBASIS, Lec.

Contains only one Canadian species, *M. unicolor*, Kirby. (Fig. 2.) The body is black, covered with whitish hairs which give an ashen appearance to the insect. The male differs from the female in having the second antennal joint longer than the third and fourth together.

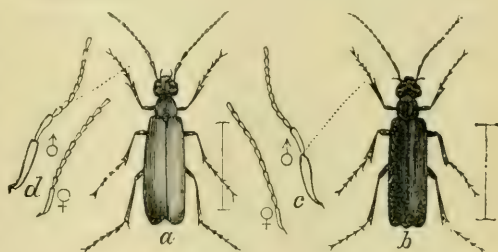


FIG. 2.

Length, .32-.64 in. Often occurs in such numbers on potato vines as to do considerable mischief.

EPICAUTA, Redt.

Four species recorded from Canada are included here. They resemble only the preceding genus in form and may be readily separated from it by the antennal characters. In habits they also resemble *Macro-*

basis, being found commonly on flowers or herbage. We have taken *trichrus* on convolvulus, *pennsylvanica* on golden-rod, *ferruginea* on Helianthus, and *vittata* on various low plants along river banks.

Elytra yellowish with two black stripes. .50-.80 in. *vittata*, Fab. (Fig. 3). Elytra unicolorous, never striped.

Antennæ scarcely tapering to tip, joints nearly cylindrical.

Colour usually black; head in great part red; varies occasionally in being entirely covered with cinereous pubescence; thorax longer than wide, more densely punctured than the head.

.30-.50 in. *trichrus*, Pall.

Colour ferruginous or cinereous, owing to the dense pubescence; thorax not longer than wide, not differently punctured from the head; antennæ short. .12-.36 in. *ferruginea*, Say.

Antennæ tapering at tip, joints looser and more constricted or narrowed at base.

Black, coarsely pubescent; head and thorax similar in punctation. .28-.50 in. *pennsylvanica*, DeG.

POMPHOPÆA, Lec.

P. Sayi, Lec., has been reported from the Sudbury district. It is a greenish insect, .60-.70 in. long, with short antennæ which enlarge towards the tip. The legs are reddish-yellow; the knees, tips of tibiæ and tarsi, dark.

CANTHARIS, Linn.

Two very fine metallic green or bronzed species belong here. They separate best by the use of secondary sexual characters, as made known by Dr. Horn, thus:—

Fifth abdominal segment of ♂ with a broad emargination, which is bisinuate at bottom; lateral lobes rather prominent. Female with hind trochanter subangulate. .64-1.10 in. *Nuttalli*, Say.

Fifth abdominal segment of ♂ with an acute notch at middle, the lateral lobes broadly rounded. Hind trochanters of ♀ not subangulate. .50-.70 in. *cyanipennis*, Lec.

In both of the above species the hind trochanters of the male are armed with a spine at middle, and by this character they may be separated from *C. viridana*, Lec., which occurs in the Northwest Territory. The males here have the hind trochanters unarmed.

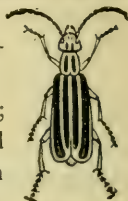


FIG. 3.

In the further study of the Meloidæ the student will find the following works of value :—

1853. Leconte, J. L. Synopsis of the Meloides of the United States. Proc. Acad. Nat. Sci., Phil., VI.
1866. Leconte, J. L. New Species of North American Coleoptera. Smithsonian Institution. *Pyrota*, p. 159; *Pomphopæa*, p. 160.
1873. Horn, Geo. H. Revision of the Species of Several Genera of Meloidæ of the United States. Proc. Am. Phil. Soc., XIII.
1875. Horn, Geo. H. Synonymical Notes and Descriptions of New Species of North American Coleoptera. *Zonitis*, p. 155. Tr. Am. Ento. Soc., V.
1878. Horn, Geo. H. Contributions to the Coleopterology of the United States, No. 2. *Calospasta*, p. 59. Tr. Am. Ento. Soc., VII.
1880. Leconte, J. L. Short Studies of North American Coleoptera. Trans. Am. Ento. Soc., VIII. *Nemognatha*, p. 212.
1885. Horn, Geo. H. Studies among the Meloidæ. Trans. Am. Ento. Soc., XII.

In addition to the above, a few notes on the smaller genera have been published, and certain portions of various larger ones gone over, but these titles have been omitted for lack of space.

THE NORTH AMERICAN SPECIES OF GNATHODUS.

BY CARL F. BAKER, FORT COLLINS, COLO.

The genus *Gnathodus*, as at present accepted, includes forms closely allied to *Cicadula*, but differing in having only two apical cells in the wing. They are of a weaker build than species of *Cicadula*, and a characteristic appearance from above makes them readily distinguishable from any of that genus. The species are very variable and difficult to define. They are small, more or less slender, greenish, yellowish, or whitish Jassids, usually without distinct markings. The ocelli are distant from the eyes. The clypeus usually somewhat exceeds the genæ. The ovipositor rarely exceeds the pygofer. In the United States at least, most of the species are of very wide distribution.

TABLE OF SPECIES.

- A. Head wider than pronotum; vertex not at all produced; colour very pale sordid greenish-fuscous, elytra whitish-subhyaline, sternum black; length, 3-3.25 mm. *abdominalis*.
- AA. Head narrower than pronotum, often much so.

- B. Sternum green or yellow.
- C. Size medium to small; length, 3-4.25 mm.; vertex not strongly produced.
- D. Elytra whitish-translucent; head and thorax pale olive-green; slender; length, 3.5-4 mm. *impictus*.
- DD. Elytra whitish-subhyaline, greenish to yellow on basal two-thirds; head and thorax yellow or yellowish-green; robust, length, 3.75-4 mm. *impictus*, var. *flavus*, n. var.
- DDD. Elytra pale greenish-hyaline; head and thorax green; slender, length, 4.25 mm. *medius*, n. sp.
- CC. Size large; length, 5 mm.; vertex strongly produced; yellowish throughout, with hyaline elytra. *manitou*.
- BB. Sternum black.
- E. Face at least, and usually vertex, pronotum, and scutel, with distinct fuscous markings.
- F. Elytra not distinctly maculated with black; vertex not produced. *confusus*.
- FF. Elytra more or less strongly marked with black; vertex distinctly produced. *punctatus*.
- EE. Face, vertex, pronotum, and scutellum, greenish, without distinct fuscous markings.
- G. Elytra whitish-translucent throughout; veins narrowly greenish; slender, length, 4.25 mm. *occidentalis*, n. sp.
- GG. Elytra pearly-white, green towards the base; veins broadly green; robust, length, 4.5 mm. *Livingstonii*, n. sp.

Gnathodus abdominalis, VanD.

1892. VanDuzee, CAN. ENT., XXIV., p. 113.

1894. VanDuzee, Trans. Am. Ent. Soc., XXI., p. 307.

1895. Gillette & Baker, Prelim., List Hemip., Colo., p. 104.

1895. Gillette, 7th Ann. Rep. Colo. Exp. Sta., p. 60.

Head wider than pronotum. Face a fourth wider than long. Front two-sevenths longer than wide, two and one-sixth times longer than the clypeus. Clypeus broader at base than at tip, sides subparallel or slightly incurved, tip broadly rounded. Vertex evenly rounded, not produced. Pronotum two and one-eighth times as wide as long, length two and a fourth times that of the vertex, hind margin nearly straight, curvature about half of the length. Ovipositor exceeding the pygofers. Hind margin of the last ventral segment in the female apparently slightly

bisinate. Plate in male evenly rounded; valves narrowly, strongly produced, exceeding the plate by twice its length; tips straight.

Colour pale yellowish-fuscous on the head and thorax, the latter sometimes with three faint longitudinal fuscous stripes. Front more or less washed with rufous. Elytra whitish-subhyaline; sternum black. Abdomen above black except margins of segments. Venter yellow. Length, 3 mm.

The above description was prepared from Colorado specimens determined as straight *abdominalis* by Mr. VanDuzee. The distribution of the species in Colorado, as far as determined, is given in Prelim. List Hemip. Colo. In this State it has been recorded from barley and sugar-beet. The species was originally described from New Jersey (Smith). I have before me, also, specimens from the collection of the Ill. State Lab. Nat. Hist., bearing data as follows: June 19, on wheat; July 27; Sept. 17, on wheat.

In the original description, Mr. VanDuzee says of the male genitalia: "Valve large, as long as the two apical ventral segments taken together; apex angled, subacute. Plates but little surpassing the valve, etc." However, in our specimens—determined by Mr. VanDuzee—they are as described above. In this genus, within certain limits, the genitalia are variable in form. Moreover, as among Typhlocybrids, many marked changes are produced in the genitalia by drying, so that most characters drawn from these parts require verification in fresh specimens.

In this species the ocelli are rather nearer to the eyes than is usual in the genus.

Gnathodus impictus, VanD.

1892. VanDuzee, CAN. ENT., XXIV., p. 113.

1894. VanDuzee, Trans. Am. Ent. Soc., XXI., p. 307.

Head narrower than the pronotum. Face one-sixth wider than long. Front two-sevenths longer than wide, twice the length of the clypeus. Clypeus as broad at tip as at base, sides subparallel, tip strongly, evenly rounded. Genæ broad below the loræ. Vertex distinctly produced. Pronotum little less than twice wider than long, length two and a-half times that of the vertex, hind margin distinctly incurved, curvature less than half the length. Ovipositor about equalling pygofer. Hind margin of last ventral segment of female truncate or slightly incurved. Plate in male strongly rounded; valves strongly produced; tips as long as discs, slender, incurved at apex; valves and pygofer with strong white spines.

Colour green, yellowish beneath and on scutel; anterior edge of pronotum and basal angle of scutel with faint indications of rufous. Abdomen above, except margins of segments, black. Elytra whitish-translucent, costa at base sometimes greenish. Length, 3.5-4 mm.

The above description was made from a male and female collected at Lakeland, Md. (F. C. Pratt). These do not fit the original description exactly in the form of the male genitalia, but the difference is not specific and the specimens are otherwise typical. I also have specimens before me from Salineville, Ohio (Cornell Univ. Coll.); Washington, D. C. (Heidemann); Ag. Coll. Miss. (H. E. Weed). Specimens from the collection of the Ill. State Lab. Nat. Hist. bear the following data:—April 23, on rye; May 7, on strawberry; May 9, on blue-grass; June 22, on wheat. The species was originally described from New Brunswick, N. J. (Smith).

Gnathodus impictus, var. *flavus*, n. var.

Slightly larger and more robust than typical *impictus*. Colour yellow or greenish-yellow throughout, including the subhayline elytra towards the base. Also varying from typical *impictus* in the form of the vertex, face, and male genitalia.

Described from three large series of specimens. The first from Ithaca, N. Y., (Cornell Univ. Coll.). The second from the collection of Mr. Chas. Hart (Illinois:—Acc. Nos. 500-512-514-522-525-526-530-535). The third from the collection of the Ill. State Lab. Nat. Hist., bearing data as follows:—May 15; June 17, on weeds; June 26, on clover; July 2 to 25.

This is one of the most puzzling lot of Jassids that has ever come to my notice. The variation in colour, form, and structure seems extreme, and yet is gradual throughout the whole series. The vertex varies from scarcely at all produced to distinctly produced. The valves in the male vary from not at all produced to the typical form, though the character of the tips is the same in every case. The specimens from Illinois are mostly entirely yellow, though greenish forms occur. On the other hand, those from New York are mostly distinctly greenish-yellow, the yellow forms being rare.

Gnathodus medius, n. sp.

Female: Head narrower than the pronotum. Face about a twelfth wider than long. Front two-fifths longer than wide, length little more than twice that of the clypeus. Clypeus with sides straight, gradually

evenly broadening to a truncate tip, exceeding the genæ more than usual. Genæ of medium width below the loræ. Vertex slightly produced at middle. Pronotum four-fifths wider than long, length four times that of the vertex, curvature little less than half the length, hind margins slightly concave. Last ventral segment truncate, lateral angles curved downward. Ovipositor about equalling pygofers, the latter with scattering short white spines on the apical two-thirds.

Colour yellowish-green. Front with faint indications of one or two transverse arcs. Basal angles of scutellum somewhat darker. Elytra hyaline, with nervures, and costal and inner margins at base, greenish. Sternum greenish. Abdomen above, except margins of segments, black. Length, 4.25 mm.

Pullman, Washington (C. V. Piper). This form is near *impictus*, but is longer and more slender. It also differs in other respects as described above. Larger series from intermediate points, may show it to be but a variety of *impictus*.

Gnathodus manitou, G. & B.

1895. Gillette & Baker, Prelim. List Hemip. Colo., p. 105. Fig.

"Face finely shagreened, a seventh wider than long; clypeus nearly twice as long as broad, rounded at the tip, slightly constricted before the base, basal suture strongly curved; loræ nearly as long and three-fourths as broad as the clypeus; genæ moderately broad, rather deeply depressed beneath the eyes, outer margin angularly incised below the eyes, sharply rounded below, attaining the tip of the clypeus; front one-half longer than broad, twice as long as the clypeus, gradually narrowing below, obtusely rounded above. Vertex one-half longer on the middle than next the eyes, width between the eyes two and one-half times the length at the middle. Pronotum five-sixths broader than long, two and three-fifths times longer than the vertex, curvature two-fifths of the length, posterior margin very slightly concave, anteriorly smooth, posteriorly with scattered feeble punctures, on the posterior median portion finely obliquely rugose, the lines converging backwards. Last ventral segment feebly rounded behind, nearly truncate, pygofers with numerous stout hairs along the whole length. Colour pale green, unicolorous. Elytra hyaline.

"Length, 5 mm. Described from one female.

"Manitou, July (Tucker)."

As this species is only known from the unique type, I quote the original description. The colour should have been stated as yellowish-green instead of pale green

Gnathodus confusus, G. & B.

1895. Gillette & Baker, Prelim. List Hemip. Colo., p. 104. Fig.

"Face one-fifth wider than long; clypeus twice as long as broad, basal suture strongly curved, somewhat constricted near the base, broadest near the tip; loræ about three-fourths as broad and three-fourths as long as the clypeus; genæ broadly depressed beneath the eyes, margin beneath the eyes inverted, broadly rounded below, moderately broad below the loræ and attaining the tip of the clypeus; front one-fifth longer than broad, once and two-thirds the length of the clypeus, superiorly broadly rounded. Face, vertex, and pronotum finely shagreened. Vertex scarcely longer on the middle than next the eyes, width between the eyes slightly more than four times the length at the middle. Pronotum slightly less than twice as broad as long, length nearly four times that of the vertex, curvature about one-half of length, considerably wider than the head, hind margin slightly concave. Transverse groove of scutellum black. Hind margin of last ventral segment of female truncate. Colour yellowish-green. Face sordid yellow, basal angles of the clypeus with an infuscated spot. Vertex of the same colour as the face, with three indistinct longitudinal smoky bands, the ocelli in light areas. Pronotum light yellowish-green on the anterior and lateral margins, darker green on the middle, two dark brown spots medially just back of the anterior margin, the latter in some specimens entirely obsolete. Scutellum pale yellow, basal angles darker. Elytra greenish-subhyaline, slightly maculate with brown near the clavus, somewhat smoky towards the tip. Tergum black with the apical margins of the segments yellow. Venter yellow with the first two or three segments black at the base, pygofers yellowish. Sternum black. Legs yellowish throughout, with infuscated lines on the outside of the femora.

"Length, 3.75 mm. Described from seven females.

"Pleasant Valley, seven miles north-west of Fort Collins, June 12th: Estes Park, July 12th (Gillette); Steamboat Springs, July 12th, on *Carex* (Baker).

"We have a single female specimen which seems distinct from this species, but to which at this time we hesitate giving a name. It differs as follows: The colour more yellowish. Pronotum distinctly less than twice broader than long. Length, 4 mm.

"Estes Park, July 12th (Gillette)."

I quote the original description. Larger series of this species show some variation from the types. With the exception of two specimens from the collection of the Ill. State Lab. Nat. Hist. (Acc. 1880-4620), I have seen no specimens taken outside of Colorado. This form may eventually prove to be a variety of *punctatus*. In *confusus* the vertex is evenly rounded, not produced, while in *punctatus* it is distinctly produced. *Confusus* also lacks the conspicuous maculation of the elytra. In some specimens the markings vary to a bright fulvous.

Gnathodus punctatus (Thunb.) Fieb.*

1782. Thunberg, Act. Ups., VI., p. 21 (*Cicada punctata*).

1866. Fieber, Verh. d. zool.-bot. Gesell, Wien, XVI., p. 505.

(*Gnathodus punctatus*).

1872. Provancher, Nat. Can., IV., p. 378 (*Typhlocyba rosea*).

1890. Provancher, Pet. Faune Ent. Can., III., p. 300-301 (*Typhlocyba punctata* and *T. jocosus*).

1894. VanDuzee, Trans. Amer. Ent. Soc., XXI., p. 307.

Distinguished by the more or less strongly maculated elytra and produced vertex. Otherwise very closely resembling *confusus*. A careful comparison between series of the American forms referred to this species, and authentic specimens of the European *punctatus*, would be very desirable.

This species is probably widely distributed in the U. S. I have collected it at Ag. Coll., Michigan, and at Fort Collins, Colo., and also have specimens from Ithaca, N. Y. (Cornell Univ. Coll.). There is considerable variation in colour, some specimens having strong pink or roseate suffusion, others being quite strongly green.

Gnathodus occidentalis, n. sp.

Head narrower than pronotum. Face an eighth wider than long. Front about a half longer than wide, and twice the length of the clypeus. Clypeus gradually broadening to the very slightly rounded tip. Genæ broad below loræ. Vertex very slightly produced at the middle. Pronotum about seven-eighths wider than long, three and two-thirds the length of the vertex, curvature seven-fifteenths of the length. Last ventral segment of female truncate at tip. Ovipositor equalling pygofer,

*The synonymy of this species is essentially the same as that given by Mr. VanDuzee in his "List of N. A. Jassoidea." The extended European bibliography I do not attempt to give.

the latter with very short, weak, white spines. Valves of male with long white spines on edges of discs, tips produced into finger-like processes as long as discs.

Colour pale green. Face with faint indications of about three brownish arcs. Basal angles of scutellum yellowish. Elytra milky white, with the veins and costal margin greenish. Sternum black. Abdomen above, and beneath at base, except margins of segments, black. Length, 4.25 mm.

Pullman, Washington (C. V. Piper). This form may prove to be a variety of *medius* on the examination of large series, but it differs in having a black sternum and milky elytra.

Gnathodus Livingstonii, n. sp.

Female: Head narrower than the pronotum. Face a twelfth wider than long. Front a fourth longer than wide, somewhat less than twice the length of the clypeus. Clypeus gradually broadening to the truncate tip. Genæ narrow below the loræ. Vertex very slightly and broadly produced, with a small but distinct pit on either side at base, midway between the median line and eye. Pronotum two-thirds wider than long, about four times the length of the vertex; curvature seven-sixteenths of the length, hind margin straight. Hind margin of last ventral segment truncate. Ovipositor about equalling pygofers, the latter with rather long whitish spines on the apical two-thirds.

Colour bright, rather deep, green. Scutellum yellowish at basal angles. Elytra pearly-white, greenish towards the base, nervures broadly green. Sternum, abdomen above and at base beneath except margins of segments, black. Robust. Length, 4.5 mm.

Corfield, Vancouver Island, B. C. (Mr. Clermont Livingston). This is one of many most interesting things which Mr. Livingston's industry has turned up in Vancouver Island, and I take pleasure in dedicating it to him. It is near *occidentalis*, but is longer, more robust, and differs in coloration.

PROSOPIS SUBTILIS.

Prosopis mesillæ, n. n.

Syn. *P. subtilis*, Fox in litt., Ckll., Tr. Am. Ent. Soc., 1895, p. 295.
(Not *P. subtilis*, Forst.) T. D. A. COCKERELL.

NEW CULICIDÆ FROM NORTH AMERICA.

BY D. W. COQUILLET, WASHINGTON, D. C.

In the course of identifying the Culicidæ in the National Museum collection and those received by Mr. L. O. Howard from various correspondents, for mention in a paper which he is about to publish, entitled, "Notes on the Life-history of *Culex pungens*, with remarks about other Mosquitoes," three forms were met with which clearly represent new species; and as Mr. Howard desires to exclude all matter of a purely technical nature from his paper, it was deemed advisable to publish the new species in one of our scientific periodicals. Accordingly, the descriptions are offered herewith:—

Culex signifer, n. sp.—♀. Head velvet black, its tomentum silvery-white, the pile black; antennæ, proboscis and palpi black, their tomentum mixed brown and silvery-white, that on apices of palpi wholly silvery. Thorax velvety brownish-black, marked on the anterior half with two silvery-white subdorsal vittæ, and with a silvery-white arcuate lateral line extending the entire length of the thorax; pleura marked with several spots of silvery-white tomentum; scutellum with two spots of similar tomentum on the upper side and one at the tip. Abdomen black, its tomentum violaceous, that at base of each segment white. Legs brown, femora largely yellowish, the tomentum mixed brown and silvery-white, that at apices of tibiæ pure white, each end of tarsal joints white, most extended on the hind tarsi; tarsal claws destitute of teeth on the under side. Wings hyaline, veins yellowish, the scales mixed brown and white; length, 4.8 mm.

District of Columbia. A single specimen, captured by the writer in June.

Near *fasciatus*, Fabr., but the lateral silvery line on the thorax is not strongly bent inward at the middle, and the tarsal claws are not toothed.

Culex tarsalis, n. sp.—♂. Head black, its pile and tomentum mixed brown and white; antennæ brown, apices of joints one to eleven broadly white, the hairs gray; proboscis nearly twice as long as the head and thorax united, naked, black, marked near the middle with a broad white ring; palpi slender, tapering to the tip, brown, the base of each joint white, sides of last two joints and outer side of the preceding one rather long gray pilose. Thorax black, marked with a dorsal gray vitta, tomentum of thorax yellowish, except a white subdorsal undulating line each side, a spot in front of the scutellum, above the root of each wing, and on

the pleura. Abdomen black, a fascia of white tomentum at base of each segment and at apices of the last three. Legs brown, in front and behind covered with white tomentum, bases of femora yellow, both ends of tarsal joints broadly white: front and middle tarsal claws each bearing a tooth on the under side, hind tarsal claws simple. Wings hyaline; scales of veins brown, with a few white ones intermixed.

♀ same as the ♂, with these exceptions: Palpi black, the apex broadly and inner side of apex of the penultimate joint covered with white tomentum: antennæ wholly brown; tarsal claws destitute of teeth. Thorax sometimes yellowish-brown. Length, 4.5 mm.

Argus Mts. and Folsom, Calif. One male and four females in the National Museum, collected by Mr. A. Koebele.

Closely related to *teniorhynchus*, Wied., but in that species the male has a tooth on under side of one tarsal claw and two beneath the other claw, and the female has each front tarsal claw toothed.

Megarhinus rutila, n. sp.—♂. Head black, tomentum of occiput blue in the centre, white next the eyes; antennæ brown, the first joint covered with blue tomentum on the outer side, that on the inner side silvery-white: hairs of antennæ dark gray, their bases brown; proboscis and palpi black, covered with an appressed blue, golden and violet tomentum. Thorax brown, its tomentum golden-brown and violet, that on the lateral margins pale golden; humeral angle and two large spots on the pleura covered with golden tomentum, scutellum covered with blue, black and violet tomentum. Abdomen black, its tomentum blue, becoming violet at the tip, that on the lateral margins golden, on the venter blue, mixed with a few golden ones; sides of abdomen bearing a few short pale yellow hairs. Legs black, the tomentum mixed blue, violet and golden, that on the coxæ and apices of femora entirely golden; second joint and base of the third of each front and middle tarsi, fourth joint and base of the fifth of the hind tarsi, white; one claw of each front and middle tarsi toothed, the other claws simple. Wings hyaline, costal margin and the veins brown, the scales blue and violet.

♀ same as the ♂, with these exceptions: First joint of antennæ destitute of blue and silvery tomentum; second, third and base of fourth joint of the front and middle tarsi, white: tarsal claws simple. Length, 7 to 10 mm.

North Carolina and Georgiana, Florida. Three males and five females in the National Museum.

Readily recognized by the colouring of the tarsi.

IN REPLY TO CRITICISM.

BY HARRISON G. DYAR, PH. D., NEW YORK.

Mr. J. W. Tutt's article (Trans. Ent. Soc., Lond., 1895, pp. 343-362), reviewed by Mr. Grote (CAN. ENT., XXVII., p. 326), in which he correlates the recent attempts at a classification of the Lepidoptera, is both instructive and stimulating. Mr. Tutt is to be thanked for his useful and impartial criticism. As far as my own work on the larvæ is concerned, the following points are brought out:—

(1) The position of the Pyromorphidæ, Megalopygidæ and Eucleidæ was not found entirely from larval characters, and I am criticised for this. I accept the criticism; but at the time I had no material to prove their position entirely on larval characters. At present I have. Dr. Chapman, with his usual generosity, sent me several species of Anthroceridæ in stage I. (*Anthrocera lonicera*, *Adscita statices*, *A. geryon* and *A. globulariæ*), and all show the position of the stage to be such as I assumed for the position I assigned the families to. The Anthroceridæ have a primitive first stage: tubercles i. and ii. approximate, iii. normal, iv. and v. approximate, vi. (and the other thoracic subprimaries) absent, vii. on the leg base. The Pyromorphidæ have not been examined, but must go with the Anthroceridæ (Mr. Tutt's Zygaenidæ). The Megalopygidæ and Eucleidæ (=Limacodidæ) have no primitive first stage: but I have gotten at the arrangement of their tubercles in another manner. I have shown that the group of smooth Eucleid larvæ have their spinose warts greatly reduced by degeneration. This has proceeded so far that the setæ have reverted to the primitive condition. Not in the first stage, however, for here another peculiar process of extreme reduction has set in, whereby setæ i. and ii. have coalesced at base, forming a Y-shaped process, and in other species one arm of the Y has shortened, leaving apparently a single knobbed seta. But, after stage I. and before the larva is old enough so that the setæ are too small to be well examined, the characteristic high Micro. type of setæ is very evident, in our *Apoda y.inversa* and presumably also in the closely allied European *A. arellana* (*Limacodes testudo*). The details of the thoracic setæ confirm these conclusions nicely. The Megalopygidæ I assume to go with the Eucleidæ. I have no direct proof for them, as the primitive first stage is wanting, and I have yet to see any degenerate forms.

(2) My failure to divide the Tineina, due to lack of material, is noticed. I have been able partially to remedy this lack (see Journ. N.

Y. Ent. Soc., III., pp. 18-21), but I do not find that the larvæ present any remarkable diversity of structure. Some are exceedingly generalized: so much so as to suggest that they represent the stem form which gave rise to the Noctuina (Agrotides, Grote) as well as to the higher Micros. (Tineides), and I am inclined to confirm Mr. Hampson's remark, quoted by Mr. Tutt (p. 360): "As far as I am able to judge, the Tineidæ represent the ramifications of one branch of the Lepidoptera, some families generalized, others highly specialized, and not a heterogeneous collection of families sprung from various parts of the Lepidopterous tree as the old family Bombyces did."

(3) My position for the Pyralidæ among the true Micros. is shown to be at variance with the conclusions of Chapman and Hampson. This is a real difference, and is only confirmed by further material. In fact, the difference extends, as regards Dr. Chapman's classification, to all his Pyraloid obiectæ, which I have had before me. This is easily reconciled if we may suppose that the obiected pupal character has been developed independently, but in a parallel manner in more than one line of descent. In fact, I think in at least three, for I believe the Sphingides and Bombycides (Saturnians) are derived from a stem ancestral to that of the Tineides and Agrotides, whether the former two superfamilies be closely related or not. At any rate, I am content to let this contradiction stand for the present.

Finally, I would correct a passage in Mr. Tutt's paper where I am unintentionally misquoted (p. 347), apparently from a misunderstanding. I did not intend to imply that the most primitive form of tubercle is found "exclusively in the Jugatæ and Psychidæ," as Mr. Tutt's quotation reads. The original sentence is: "It is found in the less specialized families of all the groups . . . and exclusively in the Jugatæ and in the Psychidæ." As a matter of fact, I separated the Psychidæ thus from a consideration of the supposed homology of tubercles i. and ii. (see Synopsis, Ann. N. Y. Acad. Sci., VIII., p. 203), not from the generalized condition of the setæ, which clearly could not be done, as the original sentence shows. I find now that this separation was due to a misapprehension, and the Psychidæ really fall in with the other Tineides. (Compare *Hyponomeuta cognatellus* for a similar reversal of tubercles i. and ii., by which I was deceived.) However, Mr. Tutt's misinterpretation of the passage does not affect his conclusions essentially.

THE AMERICAN SPECIES OF ISOTOMA.

BY ALEX. D. MACGILLIVRAY, ITHACA, N. Y.

The genus *Isotoma*, as far as known, is confined to the Northern Hemisphere and to the more northern part of this region. Thirty-one species are recorded from Europe and Asia, while the same number is recorded in the present paper, from the Eastern United States.

The characters for differentiating the species of *Isotoma* are all drawn from the form of the claws and the apical segment of the spring. In the following descriptions, the larger claw is referred to as the superior and the smaller as the inferior claw. Several species have the superior claw trilobed when viewed from above; the lateral lobes appear as a large tooth along the outer margin of the claw when viewed from the side. The tarsi consist of a single segment. The apices of the tibiae in many species bear long, club-shaped hairs, which are known as tenant hairs. The spring is known technically as the furcula, its basal segment as the manubrium, the middle segment as the dentes, and the apical segment as the mucro. In the following descriptions, the furcula is considered as if extended caudad, the toothed edge being dorsad. The horizontal teeth of the mucro are those having their axis parallel to the axis of the mucro, and the vertical teeth those in which their axis is perpendicular to the axis of the mucro. The teeth are numbered from the apex cephalad. No measurements are given, as they have been looked upon as worthless; the formulæ of the claws and mucro are all that are necessary to recognize the species, young or adults.

I am under obligations to Mr. Samuel Henshaw, Museum Comparative Zoology, Cambridge, Massachusetts, for an opportunity to study the types of Dr. Packard, including all his species except *Besselsii* and *Walkerii*; to Mr. L. O. Howard, Department of Agriculture, Washington, D. C., for type specimens of *Besselsii* and of *palustris*, Muller, from Sweden, determined by Dr. Tycho Tullberg; to Mr. Nathan Banks, Sea Cliff, N. Y., and many others, who have been given due credit for the presentation of specimens.

1. Superior claw without teeth on the inner margin.....2.
Superior claw with teeth on the inner margin..... :18.
2. Mucro with the first tooth at the base of the second.....3.
Mucro with the first tooth not at the base of the second..... 8.
3. Inferior claw with a tooth on the inner margin; superior claw without
teeth on the outer or inner margins; tibiae without tenant hairs;

muco with four teeth, the first at the base of the second, the second and third subequal, the fourth smaller, arising at the side; dentes longer than the manubrium; ocelli sixteen, eight on each side of the head.....4.

Inferior claw without a tooth on the inner margin, inner margin strongly, roundly, dilated; superior claw without teeth on the outer or inner margins; tibiæ with a single tenant hair; muco with three teeth, the first at the base of the second, the second and third subequal in length, vertical; dentes twice the length of the manubrium; body brownish, in some specimens with a slight indication of a median dorsal line; legs and furcula yellowish; eye spots black; antennæ twice the length of the head, the apices of the segments purplish, at base greenish. The typical specimens are from Salem, Massachusetts, and Waco, Texas. The Massachusetts specimens belong to *Isotoma viridis*, Bourlet, an European species, while the specimens from Texas are distinct, and Dr. Packard's name is retained for this form*tricolor*, Pack.

4. Dorsum with a distinct median black line.....5.
- Dorsum without a median black line.....6.

5. Yellowish, median and lateral black lines distinctly marked, median black line without lateral dilations in the third and fourth abdominal segments. Habitat—Europe, Asia, Africa, and North America**palustris*, Muller.

Yellowish, median black line with distinct lateral line-like dilations in the third and fourth abdominal segments; sides of the thoracic and abdominal segments clouded, darker near the margin. Habitat—Europe.....**palustris aquatilis*, Muller.

6. Segments yellowish, with a wide transverse black band, covering the anterior two-thirds of each segment. Habitat—Boreal Europe.....**palustris balteata*, Reuter.

Segments entirely of one colour.....7.

7. Entirely dilute greenish, immaculate. Habitat—Boreal Europe**palustris prasina*, Reuter.
- Entirely reddish-violaceous; antennæ and feet blue-black. Habitat—Boreal Europe**palustris fucicola*, Reuter.

*Species not seen.

8. Mucro with the first tooth horizontal, without any tendency towards forming a vertical or subvertical hook.....9.
 Mucro with the first tooth vertical or subvertical, at least somewhat hooked.....11.
9. Mucro with two teeth.....10.
 Mucro with three teeth—the first very short, horizontal, appearing somewhat as when the first tooth is at the base of the second; the second and third, long, vertical, subequal. There is a round knot-like prominence at the base of the mucro, but it is not tooth-like; superior claw without teeth on the outer and inner margins; inferior claw scarcely dilated on the inner margin, with a tooth at middle; dentes twice the length of the manubrium; the furcula reaching the ventral tubé; body, legs and furcula, yellowish; eye spot black; antennæ a little longer than the head, purplish at apex. Habitat—Salem, Ohio.....*aequalis*, n. sp.
10. Manubrium longer than the dentes; furcula not reaching the ventral tube; superior claw without teeth on the outer and inner margins; inferior claw with the inner margin not at all dilated, and without teeth; tibiæ with two tenant hairs; body mottled grayish, paler at the apices of the segments; antennæ and legs white; antennæ but little longer than the head; body long and slender. Habitat—Fort Collins, Colorado (Carl F. Baker).....*elongata*, n. sp.
- Manubrium shorter than the dentes, not extending beyond the apex of the abdomen; furcula not reaching the ventral tube; superior and inferior claws without teeth; inner margin of the inferior claw greatly and roundly dilated; mucro with two teeth—the first horizontal and pointedly rounded, the second vertical, of the same length as the first, pointed at apex; body, legs, antennæ, and furcula, white; antennæ not longer than the head. Collected on water drawn from a well. Habitat—Baton Rouge, Louisiana (H. A. Morgan).....*manubriata*, n. sp.
11. Mucro with two teeth.....12.
 Mucro with three or more.....13.
12. Teeth of mucro indistinct; mucro shaped like a portion of the rim of a wagon wheel, the cut end transversely emarginate, the dorsal and ventral corners forming the teeth; the superior and

inferior claws without teeth; the inferior claw dilated on the inner margin; antennæ not twice as long as the head. Habitat—Nova Zembla, Northern Siberia, and

Greenland **bidendiculata*, Tullb.

Teeth of mucro distinct, prominent, two first slightly longer than the second, both pointing caudad; superior and inferior claws without teeth; inferior claw of inner margin roundly dilated at middle; furcula reaching the ventral tube; dentes twice as long as the manubrium; body and antennæ blackish; legs and furcula white; antennæ a little longer than the head, the second and third segments dilated at apex. Habitat—Salineville, Ohio *parva*, n. sp.

13. Mucro with three teeth 14.

Mucro with four teeth—the first short, hooked; the second, long, vertical, and about as long as the mucro is wide; the third and fourth subequal to the second, vertical and opposite; superior claw without teeth; the inferior claw without teeth, but with the inner margin broadly, roundly, dilated; furcula not attaining the ventral tube; the dentes and manubrium subequal in length; body and antennæ yellowish, mottled with gray; legs and furcula white; antennæ not longer than the head. Habitat—Dover, Massachusetts (A. P. Morse) . . . *unica*, n. sp.

14. Superior claw with a tooth on the outer margin, inner margin without teeth; inferior claw without teeth, and the inner margin broadly, roundly, dilated; mucro with three teeth, the first and second of the same length, pointing in the same direction, and in the same line, the third shorter, vertical; furcula attaining the ventral tube; dentes twice the length of the manubrium; body and antennæ brownish-black; legs and furcula white; antennæ a little longer than the head. Habitat—Salem, Ohio *communa*, n. sp.

Superior claw without a tooth on the outer margin 15.

15. Second tooth of mucro shorter than either the first or third, the third as long or longer than the first, all pointing dorso-caudad; superior and inferior claws without teeth; inferior claw somewhat dilated on the inner margin towards the base; furcula reaching the ventral tube; dentes twice the length of the

* Species not seen.

manubrium ; body and antennæ dilute purplish ; legs and furcula white ; antennæ a little longer than the head. This species is paralleled in the European fauna by *Isotoma sensibilis*, Tullb.

Habitat—Salineville, Ohio. *trispinata*, n. sp.

Second tooth of mucro as long as either the first or third. 16.

16. Inferior claw without a tooth on the inner margin. 17.

Inferior claw with a tooth on the inner margin, strongly dilated at middle ; superior claw without teeth on the outer or inner margins, the outer margin roundly interrupted at middle ; mucro with three teeth, the first long, terminal, evenly curved, and of the same length as the second, the second and third of the same length, opposite, as long as the mucro is wide, and pointing in the same direction as the first ; furcula long, reaching to near the ventral tube ; dentes very slightly longer than the manubrium ; body yellowish ; furcula and legs white ; antennæ yellowish, apices of the segments purplish ; apical segment semi-circular. Habitat—Fredericksburg, Virginia (William D. Richardson. *tridentata*, n. sp.

17. Furcula reaching the ventral tube ; the dentes twice as long as the manubrium ; superior and inferior claws without teeth ; inferior claw with its inner margin roundly dilated towards the base ; mucro with three teeth, the first tooth distant from the second, making a prominent curve, and pointing dorso-caudad, the second and third vertical, subequal in length, if any difference the third the shortest ; body, legs, antennæ, and furcula, white ; antennæ slightly longer than the head ; eye spots black. It is impossible to distinguish living specimens of this species from the smaller species of *Lipura*, except when they jump. Habitat—Maine, Massachusetts, and New York. . . *albella*, Pack.

Furcula not reaching the ventral tube ; the manubrium distinctly longer than the dentes ; superior and inferior claws without teeth ; the superior claw wide at base, a short distance from which it is suddenly and greatly constricted ; the inferior claw with the inner margin dilated at base, rounded out at apex ; mucro with three teeth, the first long, subvertical, distinctly hooked, the second and third of the same length, on opposite sides, and almost opposite ; body, legs, antennæ, and furcula, blackish ; head elongate ; antennæ about as long as the head,

- the first and second segments dilated, as broad as long, and twice as broad as the third or fourth. Habitat.—Polaris Bay.....*Besselsii*, Pack.
18. Superior claw with one tooth on the inner margin.....19.
Superior claw with two teeth on the inner margin.....33.
19. Superior claw with a tooth on the outer margin.....28.
Superior claw without a tooth on the outer margin.....20.
20. Inferior claw with a tooth on the inner margin.....26.
Inferior claw without a tooth on the inner margin.....21.
21. Mucro emarginate at apex, the dorsal angle immediately dorsad of the ventral angle, with two teeth, the dorsal angle being the first, the second of the same length, but more pointed; furcula reaching the ventral tube; dentes twice the length of the manubrium; superior claw with a single tooth on the inner margin and none on the outer margin; inferior claw without teeth, dilated at base, the dilation interrupted before the middle, making a right angle; antennæ and body bluish-black; legs brownish; furcula white; antennæ one-third longer than the head. Habitat—Salineville, Ohio.....*brunnea*, n. sp.
Mucro not emarginate at apex.....22.
22. Mucro with two or three teeth.....23.
Mucro with four teeth, the first minute, a mere hook, the second and third of the same length, vertical, as long as the mucro is wide, the fourth slightly shorter than the third and laterad of it, its base in a more dorsal plane, and pointing caudad; furcula attaining the ventral tube; dentes more than twice the length of the manubrium; superior claw with a single tooth on the inner margin and none on the outer margin; the inferior claw without teeth, the inner margin slightly dilated; body and antennæ mottled black; legs and furcula white; antennæ longer than the head. Habitat—Salineville, Ohio.....*synonymica*, n. sp.
23. First tooth of mucro horizontal or subhorizontal.....24.
First tooth of mucro forming a distinct hook.....25.
24. Mucro with three teeth, the first subhorizontal, broad, the second and third longer than the first, of equal length, one behind the other, pointing cephalad; furcula not reaching the ventral tube; the dentes twice the length of the manubrium; superior claw without teeth on the outer margin and with a single tooth on the

inner margin; inferior claw without teeth, the inner margin broadly, roundly, dilated; tibiæ with two tenant hairs; body dilute black; antennæ, legs, and furcula, dirty white; manubrium scarcely extending beyond the apex of the abdomen; body long and slender; antennæ not longer than the head. Habitat—Dover, Massachusetts (A. P. Morse), and Ithaca, New York. *dilatata*, n. sp.

Mucro with two teeth, the first horizontal, the second vertical, of the same length as the first; furcula not reaching the ventral tube; dentes slightly longer than the manubrium; superior claw without a tooth on the outer margin, and with a single tooth on the inner margin; inferior claw without teeth, and not dilated on the inner margin; body, legs, antennæ, and furcula, white; manubrium not extending beyond the apex of the abdomen; antennæ of the same length as the head. Habitat—Maine and Massachusetts. *nivalis*, Pack.

25. Dentes and manubrium subequal in length; furcula not attaining the ventral tube; superior claw without teeth on the outer margin, and with a single tooth on the inner margin; inferior claw without teeth, the inner margin not dilated; mucro with three teeth, all in the same line, the first terminal, minute, vertical, and forming a distinct hook; the second and third as long as the mucro is wide, and pointing cephalad; body, antennæ, and legs blackish-purple; furcula white; antennæ short, hardly as long as the head, the fourth segment longer than the three basal segments combined. Habitat—Salineville, Ohio. *brevipenna*, n. sp.

Dentes more than twice as long as the manubrium; furcula attaining the ventral tube; mucro with three teeth, the first long, distinctly hooked, not extending dorsad beyond the middle of the second tooth; the second long, pointed, broad at base, about as long as the mucro is wide, and pointing dorsad; the third cephalad of the second, about half as large, and extending dorso-ventrad; superior claw without teeth on the outer margin, and with a single tooth on the inner margin; inferior claw without teeth, the inner margin greatly dilated; body, legs, antennæ, and furcula, snuff-yellow; antennæ about twice as long as the head. In determining this species great care will need to be taken, or

the tooth on the inner margin of the superior claw will be overlooked; it is very faint, scarcely perceptible in some cases. The type specimens of *Isotoma Walkerii* appear to be lost. There is nothing in the description of *Walkerii* to hinder its being united with *Isotoma leonina*. The only definite characters given in the description of *Walkerii* are a comparison of the lengths of the segments of the antennæ. Specimens that are undoubtedly *leonina*, and compared with the types of that species, do not differ from the description of *Walkerii*. A very common species under the bark of recently felled trees.

Habitat—Massachusetts (Packard); Ithaca, New

York..... *Walkerii*, Pack.

26. Tibiæ without tenant hairs; superior claw without teeth on the outer margin, and a single tooth on the inner margin; inferior claw with a tooth on the inner margin; mucro with three teeth—the first forming a blunt, subhorizontal, obliquely rounded end; the second and third of the same length, about as long as the mucro is wide; the third tooth in a higher plane than the second; furcula not attaining the ventral tube; dentes longer than the manubrium; body black, paler at apices of the segments; antennæ dirty white; legs and furcula white; antennæ as long as the head. Habitat—Salineville, Ohio... *obsoleta*, n.sp.
- Tibiæ with tenant hairs..... 27.
27. Mucro with three teeth—the first long, distant from the second, and making a distinct vertical hook; the second of the same length as the first, vertical, and in the same line; the third smaller than the second, and not in the same line; furcula attaining the ventral tube; dentes twice the length of the manubrium; superior claw without teeth on the outer margin, and a single tooth on the inner margin; inferior claw greatly dilated at base, dilation squarely interrupted at middle, and with a distinct tooth on the outer angle of the dilation; tibiæ with two tenant hairs; body and antennæ black, paler at the juncture of the segments; legs dirty white, blackish at base; furcula white; antennæ slightly longer than the head; a bristle at the apex of the dentes extends beyond the apex of the mucro. Habitat—Dover, Massachusetts (A. P. Morse)..... *determinata*, n. sp.

Mucro with three teeth, the first horizontal, short, the second and third long and slender, vertical, about as long as the first, and as long as the mucro is wide; furcula not attaining the ventral tube; dentes slightly longer than the manubrium; body and antennæ grayish-yellow; legs and furcula white; antennæ slightly longer than the head. Habitat—Salineville,

Ohio... ..*inclinata*, n. sp.

28. Inferior claw with a tooth on the inner margin29.

Inferior claw without teeth, the inner margin dilated at base; superior claw with a tooth on the outer margin and another on the inner margin; mucro with three teeth, the first and third of about the same length, the first forming a distinct hook, the second half as long again as either the first or third, all vertical; furcula attaining the ventral tube; the dentes more than twice as long as the manubrium; body and antennæ black; legs and furcula brownish-white; antennæ longer than the head, the segments long and slender. Habitat—Ithaca, New York... ..*speciosa*, n. sp.

29. Mucro with four teeth... ..30.

Mucro with five teeth, the first tooth short, one-third the length of the second, the second and third subequal, vertical, as long as the mucro is wide, the fourth shorter than the third and cephalad of it, the fifth very small and laterad of the fourth; superior claw with a tooth on the outer and inner margins; inferior claw with a tooth on the inner margin; furcula reaching the second abdominal segment; dentes distinctly longer than the manubrium; ocelli fourteen, seven on each side of the head; body griseo-violaceous; antennæ about as long as the head, the last segment longest, slightly arcuate. Habitat—St. Lawrence Island, Behring Sea... ..**grandiceps*, Reuter.

30. Mucro with the first tooth distinct, prominent... ..31.

Mucro with four teeth, the first minute, at the base of the second, the second long, curved, the third and fourth opposite, of the same length as the second; furcula long, reaching the ventral tube; dentes more than twice the length of the manubrium; superior claw with a tooth on the outer margin and another on the inner margin; inferior claw dilated at base and with a tooth on the inner margin; body and antennæ blackish; furcula and legs

* Species not seen.

- white ; body, legs, and antennæ, densely hairy ; antennæ longer than the head. Habitat—Washington, D. C. (Nathan Banks).....*capitola*, n. sp.
31. First tooth of mucro shorter than the second, if as long, subhorizontal.....32.
- First tooth of mucro as long as the second, pointing dorso-caudad, and as long as the mucro is wide, the third and fourth subequal, opposite, and smaller than the second ; the furcula attaining the ventral tube ; manubrium elongate ; dentes twice as long as the manubrium ; superior claw with a tooth on the outer margin and another on the inner margin ; inferior claw dilated, with a tooth on the inner margin ; body and antennæ black and purplish ; legs and furcula brownish ; antennæ paler at base, longer than the head. Habitat—Ithaca, New York, and Salineville, Ohio.....*nigra*, n. sp.
32. Furcula attaining the ventral tube ; dentes twice as long as the manubrium ; mucro with four teeth, the first small, subhorizontal, and with a distinct hook, the first and third of the same length, the second one-half longer than the third, as long as the mucro is wide, the first, second and third in the same line, vertical, the fourth slightly longer than the third, and pointing slightly caudad ; superior claw with a tooth on the outer margin and another on the inner margin ; inferior claw dilated at base, with a tooth on the inner margin at middle ; antennæ and body black ; legs and furcula dirty white ; antennæ of the same length as the head. Habitat—Ithaca, New York, and Salineville, Ohio.....*terminata*, n. sp.
- Furcula short, not attaining the ventral tube ; dentes longer than the manubrium ; mucro with four teeth, the first small, not minute, forming a vertical hook at apex, the second and third of the same length, about as long as the mucro is wide, one cephalad of the other, the fourth smaller than the third, and placed laterad of it ; superior claw with a tooth on the outer margin and another on the inner margin ; inferior claw dilated at base, interrupted at middle, outer angle of dilation with a tooth ; body greenish-white, washed with purplish in places ; antennæ greenish-white ; apices of segments purplish ; legs and furcula white ; antennæ longer than the head. Habitat—Beverly, Massachusetts (A. P. Morse).....*lateraria*, n. sp.

33. Inner margin of inferior claw with a tooth 34.
 Inner margin of inferior claw not with a tooth, inferior claw two-thirds the length of the superior claw; superior claw with a tooth on the outer margin and two on the inner margin; mucro with two teeth, the first forming a distinct vertical hook, the first and second subequal in length, about as long as the mucro is wide; furcula reaching to near the ventral tube; manubrium and dentes subequal in length; body greenish-white, the sides and margins of the segments washed with purplish; legs and furcula white; antennæ of the same colour as the body; apices of the segments ringed with purplish, longer than the head. This species will be easily recognized by the great length of the inferior claw; in all the other species examined the inferior claw is not more than half as long as the superior claw. Habitat—Agricultural College, Mississippi (H. E. Weed). *longipenna*, n. sp.
34. Mucro with three teeth, the first long, forming a distinct hook, the second and third of the same length, opposite, and about as long as the mucro is wide; furcula long, attaining the ventral tube; dentes more than twice as long as the manubrium; superior claw with a tooth on the outer margin and two on the inner margin; inferior claw with inner margin somewhat dilated at middle, with a vertical tooth; antennæ not quite twice as long as the head; eye spots black 36.
 Mucro with four teeth, the first minute, at the base of the second, the second long, forming a hook, the third and fourth opposite, of the same length as the second, about as long as the mucro is wide; furcula attaining the ventral tube; dentes more than twice as long as the manubrium; superior claw with a tooth on the outer margin and two on the inner margin; inferior claw with a tooth on the dilated inner margin; antennæ longer than the head, purplish at apex; eye spots black; body densely covered with long bristles, one or two on each segment much longer than the others 35.
35. Body and legs uniformly grayish-white. Common under bark among the droppings of boring beetles. Habitat—Salem, Massachusetts (Packard); Brazos County, Texas (Nathan Banks); Ithaca, New York *glauca*, Pack.
 Body white, the segments marked with a broad transverse band of purplish or blue, mottled with paler. Habitat—Franconia, New Hampshire (Mrs. A. Trumbull Slosson). *glauca montana*, n. var.

36. Body yellowish-fuscos, purplish or black without a median black line 37-
 Body in great part greenish-yellow with a distinct median black line.
 Habitat—Europe; Massachusetts (Packard); White Mountains, New Hampshire (Mrs. Annie Trumbull Slosson); Long Island (Nathan Banks); Virginia (Wm. D. Richardson); Ithaca, New York *viridis riparia*, Nic.
37. Dorsum, except a few yellowish dots, entirely fuscous. The Massachusetts specimens of *Isotoma tricolor*, together with *Isotoma Belfrageii*, *purpurescens* and *plumbea*, belong to *viridis*, Bourlet.
 Habitat—Europe; Massachusetts, and Waco, Texas (Packard); Brazos County, Texas (Nathan Banks); Beverly, Massachusetts (A. P. Morse); California (Schott); Ithaca, New York *viridis*, Bourlet.
- Dorsum distinctly marked with yellowish 38-
 38. Yellowish with a distinctly marked wide transverse black band on each segment. Habitat—Boreal Europe. **viridis cincta*, Tullb.
 Yellowish, but not with such a band 39-
 39. Each segment marked at middle with a loop-shaped mark, the sides of the closed end more distant than those of the open end; the open end at the cephalic end of each segment; the closed end sometimes interrupted; the sides of the segments prominently figured with black. Habitat—Boreal Asia **viridis arctica*, Schott.
- Each segment marked with three closed and united deltoid-shaped marks. Habitat—Agricultural College, Mississippi (H. E. Weed) *viridis delta*, n. var.

Species that could not be placed from lack of specimens and of figures of the claws and mucrones:—

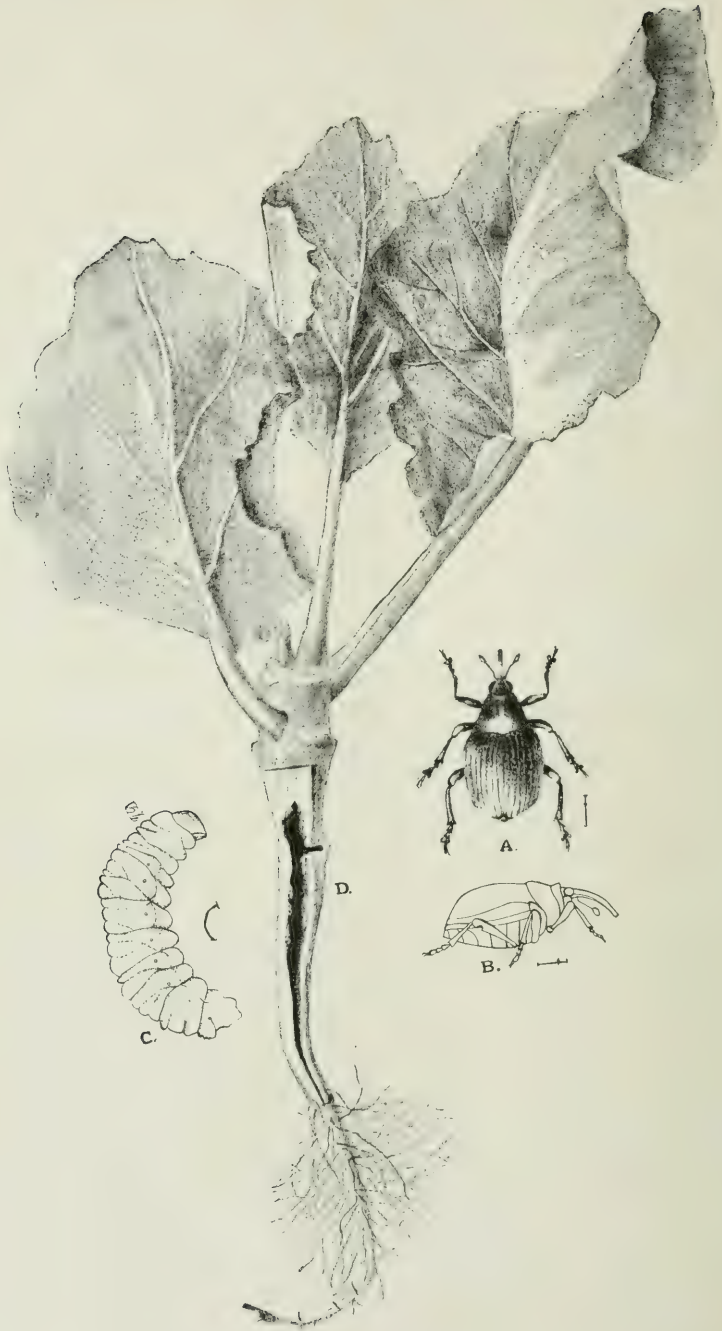
Isotoma quadrioculata, Tullb.—“Segmentum tertium abdominis brevius quam quartum, in quo furcula inserta est. Ocelli 4; 2 in utroque latere capitis. Dentes furculæ manubris non longiores, recti; mucrones bidenticulati. Long. $1\frac{1}{4}$ mm.” Habitat—Boreal Europe and America.

1872. Tullberg, Sveriges Podurider, p. 48.

Isotoma fimetaria, Linn.—“Segmentum tertium abdominis brevius quam quartum, in quo furcula inserta est. Ocelli nulli. Dentes furculæ manubrio fere duplo longiores, recti; mucrones bidenticulati. Long, 1 mm.” Habitat—Boreal and Central Europe and Boreal America.

1872. Tullberg, Sveriges Podurider, p. 48.

* Species not seen.



THE CABBAGE CURCULIO (*CEUTORHYNCHUS RAPAE*, Gyll.)

The Canadian Entomologist.

VOL. XXVIII.

LONDON, MARCH. 1896.

No. 3.

CEUTORHYNCHUS NAPI OR CEUTORHYNCHUS RAPÆ.

BY F. M. WEBSTER, WOOSTER, OHIO.

In the report of the Commissioner of Agriculture for 1888, p. 136, Miss Mary E. Murtfeldt gives some notes on the development of *Ceutorhynchus napi*, Gyll., which had worked serious injury to cabbage in Missouri, the species having been determined, as stated by Miss Murtfeldt, by the late Dr. C. V. Riley, at that time United States Entomologist. Prior to the publication of Miss Murtfeldt's notice, she had informed me of her "find," and on my writing to ask her if there was not a mistake, and if she did not refer to *rapæ*, she replied that she, too, had not felt sure of the correctness of the determination until she had written Dr. Riley a second time with reference to the species, and the determination had been reaffirmed. This appeared to settle the matter, and I was satisfied that *napi* must be correct, though not before known to occur in North America.

In Bulletin 22, Division of Entomology, United States Department of Agriculture, p. 73, Miss Murtfeldt mentions *Ceutorhynchus rapæ*, Gyll., but does not state whether or not it is the same insect that had been previously mentioned, and there is nothing to imply that such was the case.

In Bulletin 30, of the same series, p. 50, mention is again made of *Ceutorhynchus rapæ*, and this time in a manner that might imply that it was identical with *napi*, but there is nothing definite to this effect, though a correction might have been made in either this or the reference previously cited. Miss Murtfeldt was clearly going by the information given her from the Department of Agriculture, and any errors in that information would not be hers, but of the Division of Entomology, whose place it was to make proper corrections of such, even though of a clerical nature, as a matter of justice to the many who looked to the then United States Entomologist as authority on such matters.

Last May I received young cabbage plants from Montgomery County, Ohio, that were being destroyed by larvæ of some insect burrow-

ing in the stem, especially in the upper portion thereof. I found the larvæ difficult to rear in confinement, and only succeeded in securing one adult from plants removed to the insectary June 14. Correctly supposing that I was dealing with the same species as had Miss Murtfeldt, and overlooking her note in Bulletin 30, I presented the matter in my "Notes of the year in Ohio," at the last meeting of the Association of Economic Entomologists, under the name *C. napi*, Gyll., coupled with the statement that it was not in Henshaw's lists, and in this condition my paper was placed in the hands of the Secretary for publication. My single specimen, reared from affected plants, did not exactly correspond with my specimens of *rapæ*, and remembering the double determination by Dr. Riley for Miss Murtfeldt, and also not at the time having access to the latter's note in Bulletin 30, was led to a conclusion that was, perhaps, not justified, and under different circumstances would not have been arrived at by myself. I had no description of *napi* and a very poor one of *rapæ*, but the work of my larvæ corresponded so exactly with that ascribed to the former species, in Europe, as given in Bargaglia's *Rassegna Biologica di Rincofori Europei*, that I was still further misled.

Before my note went to press, however, I was informed that the old determination of *C. napi* had been found incorrect, that the species was *C. rapæ*, as was probably true of mine. I submitted my single specimen to Mr. Howard, the present U. S. Entomologist, with the request that, if it turned out to be *C. rapæ*, my note should be changed in the proof to correspond thereto. This was all very kindly done, so far as the specific name was concerned (See Bulletin No. 2, New Series, U. S. Department of Agriculture, Division of Entomology, p. 90), but, unfortunately, the statement that "the species is not yet included in Mr. Henshaw's lists of North America Coleoptera," and which was not intended to apply to *C. rapæ* at all, but to *C. napi*, was, through an oversight, allowed to stand, thus placing me in a position that demands an explanation, and which is, here and for this reason, given. *C. napi* is not yet known to occur in America.

In the accompanying plate illustrating the development of *Ceutorhynchus rapæ*, the adult is shown, dorsal view at A, lateral view at B, the larva C, excavation in affected plant in which one or more larvæ may develop at D. The drawings were made by Miss Detmers, under my supervision, and developed at the Department of Agriculture, the electrotype being kindly furnished me by Mr. L. O. Howard.

To Miss Murtfeldt belongs the credit of working out the life-history so far as this is now known, my own observations being only supplementary. Miss M. records the occurrence of larvæ, supposedly belonging to this species, in early spring burrowing in the stems of pepper-grass (*Lepidium virginicum*), and also in the same plant in July, thereby implying at least two annual broods. The injury to cabbage, as observed by her, appears to have been confined to early plants either in hotbeds or soon after having been removed therefrom. In the case of the Ohio outbreak, the attack was among young plants started late for fall and winter use. My attention was not called to the exact trouble until June 4, and both larvæ and adults were taken from these plants July 18, so that I seemed to have been dealing with the second brood. The plants were growing on low ground bordering on a pasture, and the latitude was nearly the same as that of Kirkwood, Missouri, where Miss Murtfeldt's studies were carried on. It is, of course, quite possible that the period of oviposition is protracted, and that I was dealing only with the latter part of the first brood.

REMARKABLE WORK OF INSECTS.

At the meeting (of February 3rd) of the Academy of Science, of St. Louis, Mo. (President Gray in the chair), Mr. Trelease exhibited several specimens, about three feet square, of a curious silk tapestry, taken from the ceiling of a corn-storing loft in San Luis Potosi, Mexico, by Dr. Francis Eschauzier, stating that he was informed that the larger specimen had been cut from a continuous sheet over twenty yards wide and about four times as long. The specimens, of a nearly white colour, and of much the appearance and feeling of a soft tanned piece of sheepskin, were shown to be composed of myriads of fine silken threads, crossing and recrossing at every conceivable angle, and so producing a seemingly homogeneous texture. Although specimens of the creatures by which they are produced had not been secured, it was stated that there was no doubt that these tapestries are the work of lepidopterous larvæ which feed upon grain, the presumption being that they are made by the larvæ of what has been called the Mediterranean Grain or Flour Moth (*Ephestia Kühniella*). The speaker briefly reviewed the history of this insect and its injuriousness in various parts of the world, and quoted from a report of Dr. Bryce, showing that in Canada, where it became established in 1889, "a large warehouse, some 25 feet wide, 75 feet long, and four stories high, became literally alive with moths in the short course of six months."

WILLIAM TRELEASE, *Recording Secretary.*

A FEW NEW SPIDERS.

BY NATHAN BANKS, SEA CLIFF, N. Y.

Micaria gentilis, n. sp.

Length, 3.6 mm.; ceph.: long, 1.4 mm.; broad, 1 mm. Cephalothorax, sternum, femora i. and ii., blackish; rest of legs i. and ii. pale yellowish; legs iii. and iv. yellow-brown, the femora scarcely darker; abdomen black above, with a narrow white band across the middle and a white spot on each anterior lower side; venter pale. Cephalothorax broad, in ♂ a little narrower; posterior row of eyes procurved, the P. M. E. oval, fully their diameter apart, and about as far from the P. S. E.; anterior row strongly procurved, the A. M. E. fully their diameter apart, and about as far from the larger A. S. E. Sternum oval, pointed behind; legs of moderate length, femora i. and ii. stouter than others, femora iii. slightly excised before the tip behind. Abdomen not constricted, quite broad, somewhat depressed, epigynum appearing much like *M. montana*, Em., but the openings are farther apart and more oblique. Tibia of ♂ palpus has short projection at tip on the outer side; the bulb is triangular in side view, the red parallel marks are along the outer edge; near the middle is a short tube.

Several specimens from Franconia, N. H. [Mrs. Annie T. Slosson]. Related to *M. perfecta* from Colorado, but larger and with a broader sternum.

Scius montanus, n. sp.

Length, 2.1 mm.; ceph.: long, 1 mm.; broad, .6 mm. Jet black, shining, almost coppery; extreme tips of palpi, tips of maxillæ, a spot on each coxa and trochanter, and an elongate spot on the femur, pale; the tarsi infuscated; pale dots on legs at origin of hairs. Cephalothorax long, moderately low, nearly flat, sides almost parallel. Eye region one-third broader than long, occupying not much over one-third of the cephalothorax; a trifle broader in front than behind; eyes of second row full as close to the dorsal eyes as to lateral eyes; A. M. E. large, distinctly separated, plainly farther from the S. E. Sternum one-fourth longer than broad, broadest in middle, pointed behind, truncate in front; coxæ i. separated by full width of lip; legs short, fourth pair longest, femora i. thicker than others; only a few indistinct spines, those on metatarsi iv. are at apex. Abdomen barely wider than cephalothorax and but little longer, pointed behind. Body and legs clothed with scattered black hairs. The ♂ palpi short, the tibia with a short process on the

outer side, twice as long as wide, and appressed to the tarsus so as to be hardly visible except in side view; palpal organ very large, with the lower part full and extended over the base of the tibia; on the outer side near tip is a crescent-shaped yellowish mark; the bulb is small and on one side, and is tipped with a minute spine-like tube.

One ♂, Mt. Washington, N. H. [Mrs. Annie T. Slosson]. A very distinct little species, and doubtless peculiar to mountains.

Dismodiscus alpinus, n. sp.

Length, 2 mm. Cephalothorax pale yellowish, blackish around eyes, sternum infuscated, abdomen dark gray, legs almost white. Structure somewhat like *Loph. decem-oculatum*, Em., with a large lobe on the clypeus as in that species, but the lobe on the head is higher, narrower, rounded above, not bilobed, clothed with short hairs on top and in front, and rises suddenly from the surface of the cephalothorax in front and behind; the P. M. E. are on the cephalothorax at its base, and not on the lobe; the holes are in a large groove on each side. The posterior row of eyes is straight, equal in size, the P. M. E. fully as far from each other as from the S. E.; the anterior row is slightly recurved, the A. M. E. very small and close together. Sternum but little longer than broad, truncate at base, pointed behind, sides rounded. Legs slender, a spine above on patella and two on tibia iv., tarsus i. plainly shorter than the metatarsus. The tibia of the ♂ palpus has above two short spines and two projections at its tip, the outer one the broader and pale, the inner one more pointed and reddish; the palpus is barrel-shaped, the tube going once around the tip as in *Diplostyla*; there is a large curved hook at base.

One ♂, Mt. Washington [Mrs. A. T. Slosson]. Although this species does not strictly agree with Simon's description of the genus *Dismodiscus*, I believe it should go here, as also *Loph. decem-oculatum*, Em. The best character for the genus to me is the clypeal lobe.

Dicyphus, Menge, which Simon unites to *Gonatium*, I would agree with Kulezynski in keeping as a separate genus, and closely related to *Dismodiscus*. The head of the ♂ has a lobe above which does not bear the P. M. E.; there is no clypeal lobe. I have seen two species from the United States, the first of which has much affinity with the type of the genus, *D. bituberculatus*.

Dicyphus bilobatus, n. sp.

Length, ♂, 2 mm. Cephalothorax orange, a little black around the

eyes, the lobe on top yellow, a black line from the hole on each side; abdomen blackish above and below, the spinnerets pale, sternum yellowish, legs and palpi pale, clothed with fine hairs. Just behind the eyes is a large bilobed body with a hole at base each side; seen from above each lobe is elliptical, and scarcely twice as long as broad, shorter than in *D. bituberculatus*. Posterior row of eyes nearly straight; P. M. E. once and a half their diameter apart, slightly farther from the S. E.; A. M. E. very small and about touching. Sternum as broad as long, triangular; legs moderately long, no spines above on tibiæ, tarsus i. shorter than metatarsus. The tibia of ♂ palpus has a long projection above near tip, much as in *D. bituberculatus*, but it is more slender, more straight and but little curved at tip; on the outer side of tibia is a very small hook-shaped appendage; the tube is moderately long, bent in the middle, and the tip supported by a hyaline sheath. The palpi are comparatively small.

Two males, one from a deep swamp near Ithaca, N. Y., the other from Olympia, Wash. [Trevor Kincaid].

Dicyphus trilobatus, n. sp.

Length, ♂, 2 mm. Cephalothorax yellow-brown, black about the eyes, lobe yellow; abdomen black, with a few light cross-lines near tip; sternum and venter black; the spinnerets pale; legs and palpi yellowish, a little brown on the coxæ. Posterior row of eyes straight; P. M. E. twice their diameter apart, much closer to the S. E.; A. M. E. close together, not so very much smaller than the S. E. Just behind the eyes is a large triangular flat body, trilobed in front, the lobes of about equal size. The sternum is broad, projecting between the hind coxæ, the sides rounded. Legs moderately long, hairy, no spines on tibiæ. The ♂ palpi are long and slender, the tibia has above a large bifid process; there are two tube-like pieces: one, starting from near the middle of the bulb, bends out and then toward the tip of the palpus; the other, starting from near the inner tip of bulb, extends toward the base of the first one; on the outer side there is a quite prominent pale-coloured projection—it is somewhat like a sheath or support for the tube.

One specimen from Ithaca, N. Y.

The genus *Erigonoplus* has the head lobed as in the preceding genera, but differs from them at once in having the anterior metatarsi of the male swollen.

Erigonoplus gigas, n. sp.

Length, 2.2 mm. Cephalothorax yellowish, black around the eyes and on the clypeus; legs and palpi pale, patellæ of legs a little darker; abdomen blackish, with narrow pale chevrons above, spinnerets pale; sternum yellow-brown. Head broad and swollen in front; posterior row of eyes slightly procurved; P. M. E. nearly twice their diameter apart, about as far from S. E.; A. M. E. far in front of P. M. E., small and close together. Behind the eyes there is a small, low, yellow body, trilobed in front and with a smaller lobe on each side. The legs are long and hairy, without spines above; metatarsi i. much enlarged in the middle, fusiform. The sternum is short, pointed between the hind coxæ, fully as broad at coxæ ii. as in front. The tibia of the ♂ palpus has on the outer tip a short, stout projection; a large hook across basal part of bulb with a projection outward from it; the tube starts from near the middle, curves along the bulb to the tip, then extends outward and curving, so as to nearly form a square.

One male from a deep and cold swamp near Ithaca, N. Y. (May).

A REPLY CONCERNING NOCTUA AND AGROTIS.

BY A. RADCLIFFE GROTE, A. M., HILDESHEIM, GERMANY.

Prof. John B. Smith on page 8 of this volume criticizes my rejection of the terms *Noctua* and *Noctuide* and says: "I state my own knowledge as follows: In Scudder's 'Nomenclator' we find

"Noctua, Klein, Moll., 1753.

Noctua, Fabr., Lep., 1776.

Noctua, Sav., Aves., 1809.

Noctuæ, Linn., Lep., 1758."

I may say, that were this "knowledge" the utmost we could attain to, my statement that "Noctua is preoccupied in the Birds" would be justified. The term "Noctuæ, Linn.," 1758, is, according to Prof. Smith, to be rejected and the generic term is to be credited to Fabricius, although Guenée and others write "Noctua, Linn.," so that the date 1758 would be ruled out. The citation "Noctua, Fabr.," 1776, if looked up, would show that it represents a bare name, and therefore [see Comstock's observations] this would also fall. We would then come to Savigny, 1809, and this would be the proper use under the rules, according to the "Nomenclator" as cited by Smith, of the name "Noctua." But while Prof. Smith's knowledge, as above stated, justifies me, it is not final.

Prof. Comstock finds that Fabricius in 1792 uses "Noctua" for 380 species, and this is not in the "Nomenclator." More than this, I have found that Fabricius uses the term "Noctua" for 309 species already in the Mantissa, 1787.* So that we are getting more light and more facts, and it may be that my rejection, although warranted by the "Nomenclator," may have to be reconsidered. But there remains the fact that the type is unknown [pending what we may hope to hear from Mr. Kirby's researches] and, also, that no author is obliged to use a generic term which has not a properly designated type. In this case I have shown at least the necessity for reviewing Guenée's statement, that *his* genus "Noctua" is a proper restriction of the Linnean term.

And now as to *Agrotis* and Prof. Smith's statements on page 6. He does not quote my full text on p. 16 of the Bremen List, where I show that he copies the sense and as near as may be my words as to the characters on which we may divide the genus, without any acknowledgment. He excuses the omission now by the "bald statement" that the contents of my paper† were not "in any sense of the word original," and that Lederer used the characters in his work on "the European Noctuids so long ago as 1857." This is the first I have heard that Lederer had worked up the American Agrotids; it would have spared me much trouble had it been so. In reality Lederer only discusses the European species, and my work on the American and my suggestions as to the characters to be found serviceable was in so far original. But the statement that the characters proposed and observed by me were not "original" seems incorrect. First: Lederer does not propose to use the unarmed fore tibiæ as an excluding character. He alternates groups of the species with armed and unarmed tibiæ.‡ So that I should have been credited for this original suggestion. Second: I am the first to discover the tuberculate front in *Agrotis*; this discovery is "original" and it does not detract from its originality that I only applied *Carneades* to the two species which I examined and only could examine at the time of my discovery, I being then very ill and having parted with my collection. That some of the European species probably have the tuberculate front is implied by Prof. Smith when suggesting that *Chera* should replace *Carneades*. But Lederer does not mention the clypeal tubercle or elevation at all.

* Grote, Die Apateliden, Mitt. Roem. Mus. San., 1896.

† CAN. ENT., XV., 51, 1883.

‡ Lederer, Syst. Noct., p. 81. I have constantly in my writings given Lederer every credit for his observations on the characters in this family.

THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XV. THE CHRYSOMELIDÆ OF ONTARIO AND QUEBEC.

The above family is of immense extent and attains, in the tropics, a considerable development in the size of its members, though not equalling in this respect its wood-eating neighbours, the Cerambycidæ. Towards the north, many groups fade out entirely and the large or gaily-coloured species decrease in number. Nevertheless, the representation in Canada is quite considerable, and since many of the species are closely allied and separate with some difficulty, while tables of genera are widely scattered, or, in many cases, not readily accessible, it has been deemed worth while to bring together the salient characters by means of which the collector in Eastern Canada may hope to identify his captures.

According to the classification followed in this country, the members of the family agree in these points: The tarsi are broad, spongy beneath, the fourth and fifth joints being so closely anchylosed as to give the appearance of but four joints; the head has the front small and oblique, the antennæ are moderate or short and not inserted upon frontal prominences. The prothorax is most frequently margined and the tibial spurs usually wanting. A few exceptions occur to each of the above characters, but most of the Chrysomelidæ may easily be recognized at sight by their resemblance to a few common types, such as *Donacia*, *Cryptocephalus*, *Chrysochus*, *Chrysomela*, *Galeruca*, *Haltica*, *Micro-rhopala* and *Cassida*. There is, however, no uniformity of family habitus, as many of the Cassidini are extremely broad and flattened, while the Cryptocephalini are occasionally nearly globular.

All of the Chrysomelidæ may be said to be vegetable feeders, and most of them are to be found in every stage upon the leaves, in the stems or about the roots of their food-plants. The larvæ are not of a very uniform type of structure, but are modified to suit their particular habits of life. Most of those that feed freely upon the surface of leaves are of rather heavy, subcylindrical or subglobular form and slow in movement. A good example of this type is to be seen in the young of the Colorado potato-beetle. Other leaf-eating larvæ, such as those of *Coptocycla* and its allies, are flattened and curiously armed with spines or covered with a coat of their own excrement. The leaf-mining or stem-boring kinds are usually of more slender, elongate shape and without the conspicuous

ornamentation displayed by so many of the free-feeding forms. A few are case-bearers and occur either at large on their food-plants or in nests of ants; to this category belong *Coscinoptera* and *Chlamys*. The larva of *Chlamys plicata* occurs commonly on grasses in the Lake Superior district, carrying its little case about and protruding only the front part of the body when feeding or crawling. When the inhabitant is ready to pupate, the open end of the case is sealed to a blade of grass and the transformations take place within.

The economic importance of the group has been recognized by all Entomologists, and certain species claim their share of our crops from year to year in spite of the constant war waged against them. The imported elm-leaf beetle, the Colorado potato-beetle, the corn-root worm, and the striped cucumber-beetle are only a few of the many injurious Chrysomelidæ which have to be fought each year in the regions which they infest.

Secondary sexual characters are to be found in the antennæ, the tarsi, the claws, and the ventral abdominal segments of many species, and are often of great value in the separation of otherwise almost indistinguishable forms. These will be referred to in the proper places when necessary for identification.

On account of the great size of the family, it seems best to avoid a long, complicated generic table by the adoption of the groups indicated in the Leconte and Horn "Classification." Each tribe will be taken up by itself and the genera contained in it separated by a table. A slight modification of the tabular synopsis presented in the work above cited may be used to advantage as follows:—

- A. Outline of body elliptical or nearly circular; prothorax and elytra with broad expanded margins, head concealed. . . . XI. *Cassidini*.
- AA. Outline of body variable, prothorax and elytra without broad expanded margins. Head usually plainly visible from above.
 - b. Front of head inflexed, mouth inferior, body wedge-shaped, broad and truncate behind. X. *Hispini*.
 - bb. Front of head not inflexed, mouth anterior.
 - c. Last dorsal abdominal segment not exposed, middle ventral segments not narrowed.
 - d. Prothorax usually margined.
 - e. Antennæ approximate at base; front coxæ conical and prominent IX. *Galericini*.

- ee. Antennæ widely separated at base.
 Front coxæ transverse, third tarsal joint usually
 entire VIII. *Chrysomelini*.
 Front coxæ rounded, third tarsal joint
 bilobed VII. *Eumolpini*.
- dd. Prothorax not margined at sides.
 f. First ventral about as long or somewhat shorter than
 the two following.
 Claws simple, elytra punctato-
 striate III. *Criocerini*.
 Claws cleft or toothed, elytral punctures
 irregular II. *Sagrini*.
- ff. First ventral about as long as all the others
 united I. *Donaciini*.
- cc. Last dorsal abdominal segment exposed, declivous. Form
 of body robust, compact, subcylindrical.
 g. Surface of body coarsely tuberculate
 above V. *Chlamydini*.
 gg. Surface of body not tuberculate.
 Prosternum not separating front coxæ; antennæ
 short and serrate IV. *Clythrini*.
 Prosternum extending between front coxæ, antennæ
 usually long and slender VI. *Cryptocephalini*.

The Roman numerals before each tribal name show the order in which they are taken up in the following pages.

TRIBE I.—DONACIINI.

Contains two genera, which are composed of very neat, graceful and usually active species, found on or about such aquatic or subaquatic plants as water-lilies, arrowheads (*Sagittaria*), pond-weed, and various sedges. They have a habitus peculiarly their own, which if once appreciated renders their future recognition easy at a glance. The head and thorax are narrower than the elytra, which are attenuated toward the tip—sometimes almost triangularly so. The antennæ are rather long, extending back beyond the base of the thorax; the under surface of the body is finely pubescent. In colour most of the species are metallic, varying to blue or green, though a few are testaceous, at least in part.

Elytra simple at tip *Donacia*.

Elytra distinctly spinose at tip *Hæmonia*.

DONACIA, Fabr.

Numerous Canadian species are known, which, from their general uniformity of appearance, are often difficult to identify. Careful attention to the points recently elaborated by Mr. Chas. W. Leng, and published by him in a late paper on the genus, should result in correct names, however. The following table is based on that of Mr. Leng, though I have changed the arrangement somewhat, in order the sooner to eliminate the more easily recognized species:—

- A. Head, thorax and elytra pubescent. .40-.44 in. . . *pubicollis*, Suffr.
- A A. Head and thorax pubescent, elytra glabrous.
 - .36-.44 in. *hirticollis*, Kirby.
- A A A. Head sometimes, thorax and elytra never, pubescent.
 - b. Elytra distinctly rounded at tip ; form convex.
 - c. Thorax depressed, no median nor basal line.
 - .24-.32 *pusilla*, Say.
 - cc. Thorax convex, basal line distinct, longitudinal one usually so.
 - d. Legs dark ; body usually metallic blue.
 - .24-.28 in. *emarginata*, Kirby.
 - dd. Legs reddish-yellow. Body usually copper-bronzed.
 - Thorax thickly punctured. .28-.36 in. *flavipes*, Say.
 - Thorax sparsely punctured. .26-.30 in. . . *rufa*, Say.
 - bb. Elytra truncate or subtruncate at tip.
 - e. Middle coxæ separated by about their own width ; body broad, distinctly flattened above.
 - f. Second and third joints of antennæ nearly equal.
 - .28-.44 in. *cincticornis*, Newm.
 - ff. Third joint of antennæ much longer than second.
 - Elytra truncate at tip. First ventral ♂ simple.
 - .36-.44 in. *palmata*, Oliv.
 - Elytra subtruncate at tip. First ventral ♂ with a pit at middle. .26-.40 in. *piscatrix*, Lac.
 - ee. Middle coxæ separated by less than their own width.
 - Body usually convex above, narrower than in preceding group.
 - g. Prothorax scarcely tuberculate at sides, surface with coarse uniform punctures.
 - .28-.44 in. *subtilis*, Kunze.

gg. Prothorax tuberculate at sides, disk uneven.

Sutural margin of elytra not sinuate, disk with two transverse indentations. .22-.28 in..*aequalis*, Say.

Sutural margin of elytra sinuate near the tip. .28-.36 in.....*distincta*, Lec.

It will be noted that several of the names on the Canadian list do not appear in the above table. These have been reduced to synonymy by Mr. Leng, as follows: *D. cuprea* becomes *pusilla*, *D. rugifrons* gives way to *emarginata*, *D. jucunda* to *flavipes*, and *D. Kirbyi* to *rufa*.



FIG. 4.

Both *proxima* and *magnifica* are considered by him to rank only as varieties of *cincticornis*, *proxima* having the prothorax punctate only at base and apex, while in *magnifica* it is coarsely punctured over the whole surface. He reduces (with an expression of doubt) *torosa* to a varietal form of *distincta*, from which it differs by Dr. Leconte's description in being of a blackish-violet colour and in having the prothorax somewhat elongate, while the same author describes his *distincta* as coppery, with the thorax quadrate. It is a matter of remark that Mr. Crotch

should have placed these forms in different and apparently well-founded divisions in his synopsis, while Mr. Leng thinks them only varietal. Fig. 4 shows the form of body common in the genus.

HÆMONIA, Latr.

The only North American species is *H. nigricornis*, Kirby, which resembles a small *Donacia* in form. Beneath, the body is blackish, the upper surface and the legs are reddish-yellow. The head, antennæ and tarsi are dark. The elytra are marked with ten long rows of punctures and a shorter one near the suture at base. Length, .20-.28 in. It is said to occur on *Potamogeton*.

TRIBE II.—SAGRINI.

The few species comprised in this group are remarkable for the plasticity of their characters and the difficulty of accurately defining their limits of variation. They are of small or moderate size and agree in having strongly punctured elytra, which are wider than the thorax. The mouth is rather prominent, the eyes very convex, giving the head a width

about equal to that of the thorax. The antennæ are moderately distant at base. The armature of the thorax will serve to differentiate the Canadian genera thus:—

- Sides of prothorax much rounded and rather suddenly narrowed behind, giving a somewhat bell-shaped appearance. . . . *Orsodachna*.
 Sides of thorax with large, distinct tubercle; small species. *Zeugophora*.
 Sides of thorax broadly angulate, more or less distinctly three-toothed; larger species. *Syneta*.

ORSODACHNA, Latr.

A single species of extreme variability (*O. atra*, Ahr.), belongs here. It is common on willow blossoms in spring, several colour-varieties often occurring together on the same tree. All intergrades are known, from entirely blackish individuals, through forms in which the thorax becomes red, with or without a central dark spot, to those with vittate elytra or even of an almost uniform testaceous. From the notes of Dr. Horn, the following key has been constructed as a guide to the best-marked varieties, but it must be borne in mind that numerous intergradations will be met with, not referable to any of these:—

A. Elytra blackish.

- Thorax blackish, legs dark. *atra*, Ahr.
 Thorax blackish, tibiae and femora testaceous. . . . *tibialis*, Kirby.
 Thorax reddish, with central dark spot. *luctuosa*, Lec.
 Thorax entirely red. *hepatica*, Say.

AA. Elytra vittate or spotted.

- Elytra dark, each with narrow yellow stripe. *vittata*, Say.
 Elytra yellowish, with sutural and lateral dark stripe. *trivittata*, Lac.
 Elytra dark, with humeral and apical yellow spot (Fig. 5). *Childreni*, Kirby.

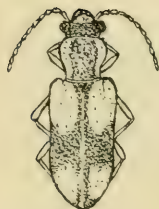


FIG. 5.

In general, they agree in these characters: The prothorax is somewhat bell-shaped, rather coarsely punctured, less so at the sides; the elytra are broad at base and with numerous closely placed, rather coarse punctures which show some slight tendency to a serial arrangement. Sides of elytra nearly parallel to about the apical third, whence they are rounded to tip. Length, .16-.28 in.

ZEUGOPHORA, Kunze.

Three are reported from Canada. They are small insects, somewhat of the form of *Orsodachna*, but proportionately shorter and more robust. The punctuation, especially of the elytra, is coarse and the prothorax has a large tubercle on each side. *Z. abnormis*, Lec., is black above, the antennæ and legs red; it reaches the length of .16 in. *Z. varians*, Cr. (Fig. 6.), is a trifle smaller (.13-.14 in.), and rather prettily coloured, the thorax being mostly piceous above, with a yellowish median stripe; the elytra are dark around the margins, the disk being occupied by a large oval or somewhat heart-shaped yellowish spot. Specimens of *Z. varians* from the Pacific slope seem tolerably constant in having the median yellow stripe of the thorax obliterated and the sides more broadly pale, while the elytra have, in addition to the usual spot, a smaller common sutural one of the same colour, near the tip. This is connected with the anterior one by a narrow yellow line. *Z. puberula*, Cr., differs from *varians* in having the thorax entirely yellow, the elytral yellowish area ill-defined. The punctures are close together, the outer joints of the antennæ black. A specimen has been sent from Toronto by Mr. Crew.



FIG. 6.

SYNETA, Esch.

Represented by *S. ferruginea*, Germ. (.30-.32 in.), a yellowish or reddish-yellow beetle of rather coarse sculpture. The thorax is angulate, with three more or less well-marked teeth on each side. The elytra are marked with four costæ of various degrees of distinctness. It is often beaten from hazel thickets.

TRIBE III.—CRIOCERINI.

A few Canadian beetles of neat form and usually striking coloration belong here. The thorax is much narrower than the elytra, which are punctate in rows. The two genera differentiate easily, thus, so far as the species under consideration are concerned:—

Prothorax with a constriction about the middle, elytra striped.. *Lema*.

Prothorax cylindrical, elytra spotted..... *Crioceris*.

LEMA, Fabr.

L. trilineata, Oliv. (Fig. 7), is the only Canadian species. It is of a



FIG. 7.

reddish colour, with two thoracic spots, the antennæ (excepting the first joint), tips of tibiæ and tarsi, blackish. The elytra are of a clear light yellow, or nearly white, with a common sutural black stripe, and each with a narrow submarginal vitta of the same colour.

Length about .25 in. (Fig. 8: *a a*

represent the larva with its singular covering of excrement, *b* the last joints of the abdomen, *c* pupa, *d* the eggs.)

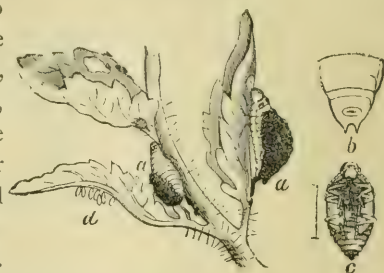


FIG. 8.

CRIOCERIS, Geoff.

Two imported European species are known from the adjacent regions, though but one of these seems to have been actually reported from Canada. They prey upon asparagus, and from the striking pattern of

coloration are easily known. *C. asparagi*, Linn., is from .16 to .24 in. long, of a greenish or bluish-black colour, the thorax red with two black spots of variable size usually present. The elytra are reddish-yellow, with a blue-black cross formed by the crossing of a longitudinal sutural stripe and transverse median band, and with an

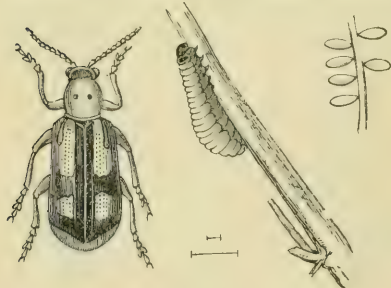


FIG. 9.

apical and basal spot of the same dark colour on each; or they may be blue-black with the outer and apical margin and three spots on each yellow. (Fig. 9 represents the eggs, larva and beetle much magnified.) *C. 12-punctata*, Linn., is .19-.24 in. long, dull red, each elytron with six black spots of variable size. The antennæ, knees, and tarsi are also black.

I desire to acknowledge the kindness of Mr. W. S. Cody, B. A., of Windsor, Ont., in contributing a Canadian specimen of *Argynnis Idalia* to the Society's collection. I am indebted to Mr. Wm. Lochhead, of Napanee, Ont., for the information that this handsome butterfly has been added to the Canadian List. J. ALSTON MOFFAT, Curator.

CANADIAN HYMENOPTERA, NO. 7.

BY W. HAGUE HARRINGTON, F. R. S. C., OTTAWA.

The object of this paper is chiefly to record some observations, made last summer, on a few parasitic forms, but mention is first made of two phytophagous species.

STRONGYLOGASTER ? *MARGINATA*, Prov.

Selandria marginata, Prov., Add. Faun. Hym., 1885, p. 8.

Eriocampa marginata, Prov., Cresson, Cat. N. Am. Hym., 1887, p. 162.

Strongylogaster primitivus, MacG., CAN. ENT., 1893, Vol. XXV., p. 241.

Tenthredopsis primitivus, MacG., CAN. ENT., 1894, Vol. XXVI., p. 327.

Mr. MacGillivray has recently kindly sent to me one of his types of *primitivus* for comparison with that of Provancher's *marginata*, and I find, as was already evident from the description, that it is the same species. The generic position of the species is, however, not so readily determined; Mr. MacGillivray being now of opinion that it belongs neither to *Tenthredopsis*, *Strongylogaster* or *Taxonus*, but probably to some yet undescribed genus. It certainly does not belong to *Tenthredopsis* as adopted by Cameron in his monograph of the British Phytophaga, nor to *Selandria*, so that I have left it for the present in *Strongylogaster*, to some of our accepted species of which it is very similar in appearance. Several of the groups of our Tenthredinidæ require revision, the classification of species solely from wing venation being unsatisfactory, for in the phytophagous hymenoptera the venation is much more unstable than in the other divisions of the order. I fear, for instance, that Mr. MacGillivray's genus *Bivena* (CAN. ENT., Vol. XXVI., p. 327) has been founded upon the accidental occurrence of a supplementary marginal cell.

CEPHUS PYGMÆUS, Linn.

The continued spread of this wheat-stem sawfly is evidenced by the occurrence of two males in a small collection made on 5th July, at Indian Head, Assa., by Mr. Fletcher, during his trip to British Columbia last summer.

PEZOMACHUS PETTITII, Cresson, CAN. ENT., 1892, Vol. IV., p. 61. ♀.

Pezomachus sulcatus, Prov., Add. Faun. Hym., 1885, p. 77. ♀.

Stibeteus Pettitii, Cr., Riley and How., Ins. Life, 1890, Vol. III., p. 154.

This is the commonest species of our wingless Cryptids, but I have noted only one mention of its having been bred, which is in the list published in *Insect Life* (*loc. cit.*) of bred parasitic hymenoptera in the United States National Museum, the record being as follows:— "*Bucculatrix* found on stone, Virginia, April 9th." The species is there referred to the genus *Stibeutes*, which in Cresson's synopsis is said to have the "Metathorax completely and regularly areolated," while in *Pezomachus* it is "not, or irregularly areolated." None of my specimens show any areolation, the indications of any metathoracic carinæ being of the feeblest nature. This insect has frequently been taken with the sweeping-net on foliage from June to September, and on one occasion in the latter month, as I was reclining under a pine tree, near Aylmer, I observed numerous examples running about on the carpet of dead pine leaves which covered the ground. They had a remarkable resemblance to some of the ants which are always roaming around in such places. Last April I obtained, under a large flake of loose bark on an elm stump, a number of egg-cocoons of an undetermined spider. They were hemispherical in shape, and made of a very white silk, and were covered by irregular tent-like masses of the same flocculent, viscid silk, spun between the bark and the surface of the wood. On opening one of the egg-masses I found two hymenopterous larvæ among the yellow eggs, and therefore secured a number of the cocoons, which, when removed, adhered to one another and formed a sticky mass in the small box in which I had to place them. Two of the parasites emerged on May 19th, and proved to be males of a *Hemiteles* not in my collection. Two days later a similar winged male appeared, and also three wingless males, which I saw belonged to *Pezomachus Pettitii*. Four wingless males, one winged male, and one female emerged the following day, and others followed until, in all, I obtained four females, seven wingless males, and six winged males. There can be no doubt that the winged forms, though differing in the shape of the thorax from those without wings, are specifically the same. This rearing confirms the opinion held by many authors [For example see Walsh, *CAN. ENT.*, Vol. II., p. 10.], of the identity of the genera *Hemiteles* and *Pezomachus*, and I have special pleasure in recording it at the present time, in view of the following recent reference to the subject by Dr. Sharp (*Cam. Nat. Hist.*, Vol. V., p. 556): "The little *Ichneumons* of the genus *Pezomachus* are quite destitute of wings, and somewhat resemble ants; they are quite common

insects in Britain. Only the female sex is known, and it is believed that the winged Ichneumons assigned to the genus Hemiteles, of which no females are known, are the males of *Pezomachus*. Repeated efforts have been made to place this beyond doubt, but they have usually failed, for when a brood of these parasites is reared the individuals generally prove to be either all Hemiteles or all *Pezomachus*. It is to be hoped that this interesting case will be fully elucidated." Of the American species assigned to *Pezomachus*, several are known in both sexes. Mr. Howard, for example, describes both ♀ and ♂ of *P. micariæ* (Proc. Ent. Soc., Wash., Vol. II., p. 194), bred by Mr. Emerton from the egg-cocoons of a species of *Micaria*. Individuals of *P. Pettitii* vary somewhat in colour and in shape of thorax, the anterior node of which is often sulcate, as in Provancher's type of *sulcatus*. Nearly all those taken in the field have the abdomen entirely dark, except the apex of first segment, while all the bred specimens have the apex of second segment also pale. The winged males appear slightly larger than the wingless, and have the abdomen slightly more elongate, but its markings are exactly the same. The fully developed thorax is black, and the wings have a large triangular stigma of a dark brown colour. The antennæ are darker, and apparently more slender.

PEZOMACHUS OTTAWAENSIS, n. sp.

Female, length, 5-6 mm. Rufous, with abdomen in part black. Head transverse, slightly narrowed behind; occiput concave; antennæ long and rather slender, 23-jointed; face subtuberculate, as also clypeus slightly; mandibles sometimes paler, with the teeth black. Thorax binodose, the nodes subequal; the rounded metathorax not areolated, but with the posterior face flattened obliquely. Abdomen with a broad rufo-orange band covering nearly all the second segment, the petiole also rufous; the second segment narrowly black at base, and the following segments black, polished; ovipositor exerted about 1 mm., sheaths black at tip.

Described from 23 females bred, with two exceptions, from egg-cocoons of spiders. This is a large, handsome *Pezomachus*, very constant in coloration, especially of the abdomen. The base of petiole, posterior coxæ, and femora are darker in a few specimens, and the vertex of head is occasionally clouded; individuals may possibly occur with the head in part black. The egg-cocoons in which this species breeds are

flattened, scale-like objects, 10-12 mm. in diameter, adhering closely to stones, and often irregular in shape to conform to the uneven surface. When new, the silk of which they are spun is of a delicate drab shade, but weathered cocoons found in spring are of a dull, dirty gray. A single larva of the *Pezomachus* occupies each infested cocoon, and when it has devoured all the spider's eggs it spins its own elongate cocoon within that of its host. This insect must be a great check upon the increase of its spider-host, for of scores of cocoons examined in one locality last spring hardly ten per cent. had escaped infestation. Through the kindness of Mr. L. O. Howard, one of these cocoons has been examined by Mr. Nathan Banks, who pronounces it to be "almost certainly a Drassid cocoon, possibly *Micaria*, but more probably *Prosthema*." The cocoons are sometimes found on the under surfaces of stones and pieces of wood, but more frequently on the upper surface of large embedded rocks.

HEMITELES OTTAWAENSIS, n. sp.

Male, length, 5 mm. Black, with segments two and three of abdomen yellowish. Head black; palpi pale; antennæ blackish, slender, about 25-jointed, scape, pedicel and base of third joint pale. Thorax black, finely punctulate or shagreened; tegulæ pale; legs rufo-testaceous, including coxæ; the posterior tibiæ and tarsi brownish; wings as usual, stigma brown; metathorax feebly areolate, the lateral and posterior transverse carinæ more distinct. Abdomen narrow, segments two and three yellowish, remainder black.

Described from one male reared from egg-cocoon of spider. The cocoon was one of a lot, gathered at same time and locality, which yielded several individuals of the previously described species, and the *Hemiteles* is probably the male of that species. I have, therefore, given to it the same specific name. As it differs, however, in the evident, though imperfect, areolation of thorax, and in colour of abdomen, etc., it may be better to separate it for the present. The abdomen is narrower and less robust than that of the winged males of *P. Pettitii*.

MASTOCHARIS WILDERI, Howard.

Twenty-two examples of this little Chalcid were bred from a hemispherical egg-cocoon of a spider, attached to the under surface of a hickory leaf. They issued, however, from the cocoon of an Ichneumonid, prob-

ably a species of *Pimpla*, which had devoured the spider's eggs. The greenish-blue reflections of the head and thorax of the females, and the bright coppery gleam of the smaller males, make these little creatures, when alive and hurrying to and fro with trembling antennæ, objects of considerable beauty. Mr. Howard records the species (Proc. Ent. Soc., Wash., Vol. II., p. 299) from James Island, S. C.; Brooklyn, N. Y.; Sea Cliff, L. I.; Washington, D. C.; and Los Angeles, Cal., showing a very wide distribution.

TELENOMUS, n. sp. ?

From two eggs found attached, and side by side, on the upper surface of a hickory leaf, I obtained thirty-one individuals (25 ♀, 6 ♂) of a *Telenomus*, which appears to be undescribed, but as the genus is such an extensive and difficult one I do not care to name it. The eggs, which are those of our beautiful pale green, swallow-tailed Luna moth, are round and flattened; white above and below, and surrounded by a dark brown band. They are about 2 mm. in diameter, and not much more than 1 mm. in thickness, so that when one was tenanted by at least sixteen larvæ, their quarters could not have been over spacious. It requires somewhat careful examination of the egg to find the minute hole from which the parasites issued.

ACOLOIDES SAITIDIS, Howard.

From the same batch of spider-cocoons which produced the seventeen examples of *Pezomachus Pettitii*, there came forth, a few days later, a host of minute Prototrypids, which seem to belong to the species named as above by Mr. Howard (Ins. Life, Vol. II., p. 270), and constituted the type of his new genus; the type specimens having been bred from eggs of the spider *Saitis pulex*. My specimens differ from the description only in having the apex of the first abdominal segment yellowish. They commenced to appear on June 4th, and by the evening of June 6th there had issued 160, nearly all of which were females. The total number that came forth was 206, consisting of 162 ♀ and 44 ♂. Such figures might indicate this to be a very common insect, yet I had never met with it in my collecting. Previous records for the species are Lincoln, Neb., and Oxford, Ind.

CHRYSID *NITIDULA*, Fabr.

One example of this beautiful green Chrysid was bred from an almost black cocoon, which was found in a cell of *Odynerus catskillensis*,

Sauss. The Odynerus cells were built of clay, upon the under surface of a stone, and formed a compact mass which could not be removed without rupturing the cells, as their silken lining adhered directly to the uneven surface of the stone.

CHYSIS PARVULA, Fabr.

This pretty species very closely resembles the preceding, but is easily separated by the shape of the terminal segment of abdomen, which is truncate and tridentate (the central tooth strongest), instead of quadridentate, with curved emarginations separating the teeth. Two examples were bred from cocoons taken from the cells of *Pelopæus cementarius*, Drury, the slender-bodied wasp whose large clay-built groups of cells are so frequently seen under window-sills and other ledges in the city, and are placed under stones in the fields. The cocoon of the parasite occupies one end of the cell made by the industrious wasp as a home for its own young, and is almost identical in shape and colour with that of the other Chysid. The insects emerged on June 2nd and 4th, the cells having been obtained some weeks previously. Mr. Ashmead has recorded (*Psyche*, Vol. VII., p. 79) the rearing of *C. perpulchra*, Cr., and *C. cerulans*, Fabr., from the same host.

CEROPALES FRATERNA, Smith.

While searching, one day in early spring, for the potato-like galls which are produced by *Tribalia* upon the roots of wild roses, I found under a flat stone, slightly imbedded in the turf, about a dozen fusiform hymenopterous cocoons, about 15 mm. long. They were scattered on the surface of the soil, and some had already become mouldy from the dampness of the ground. From those which were not so affected I obtained in due time a female and four males of *Pompilus luctuosus*, Cr., which liberated themselves by neatly cutting off the large end of the cocoon. From one of the larger cocoons there emerged in the same manner, instead of the velvety-black *Pompilus*, a long-legged, yellow-banded *Ceropales*.

AGENIA ARCHITECTA, Say.

The mud cells of this pretty little blue wasp are not uncommon under stones in dry fields near woods. They are cylindrical in shape, and several may be found on the same stone, but they are not massed together and cemented into one lump, as are those of the mud-wasps previously mentioned. The wasps have been bred several times, but I have as yet reared no parasites.

ON THE STRUCTURAL AFFINITIES OF THE GENUS DEMAS.

BY J. W. TUTT, F. E. S., LONDON, ENGLAND.

In the Journal of the New York Entomological Society, Vol. III., pp. 130-131, Mr. Harrison G. Dyar writes as follows: "Prof. E. B. Poulton has shown that dorsal eversible glands are of general occurrence throughout the *Lymantriidæ* (Trans. Ent. Soc., Lond., 1887, p. 300) on the tenth and eleventh joints (segments), or rarely only on the eleventh joint (*Dasychira pudibunda*). Probably these structures are characteristic of the family, but Prof. Poulton did not find them in *Demas*. This genus has been considered to belong to the *Noctuidæ*, but English authors assume it to be a *Lymantriid*. Mr. J. W. Tutt remarks, in speaking of Prof. J. B. Smith's recent 'Catalogue of the Noctuidæ' (Ent. Record, VI., p. 70):—"The obsolete position of *Demas* among the *Noctuidæ* is retained." Now, is this position 'obsolete?' The absence of the retractile tubercles certainly throws doubt on the matter. Now, I have shown a characteristic difference in the arrangement of the thoracic tubercles between the *Lymantriidæ* and the *Noctuidæ* (Trans. New York Acad. Sci., XIV., p. 57), and *Demas* shows the Noctuid structure. Therefore, on all essential larval characters *Demas* is a Noctuid. It might, indeed, be an Arctian, as far as the larva goes, but not a *Lymantriid*. As concerning the structure of the imago, *Demas* seems to have greater affinity with the *Noctuidæ* than any other family; in fact, it appears to me that the placing of *Demas* among the *Lymantriidæ* may properly be characterized as premature." Further, Mr. Dyar writes as follows:—"Pupa, shining dark brown with a large wrinkled cremaster and three movable incisures. Of the usual Noctuid appearance (quite unlike *Orgyia*) and passing the winter." This statement regarding the pupa must be read carefully in connection with the remarks of Dr. Chapman quoted below.

Now, I would call Mr. Dyar's attention to the following statements made by Dr. Chapman some two or three years ago. He writes:—"We now come to the two species, *Demas coryli* and *Diloba caeruleocephala*, that are certainly not very much related to each other, and though they have some indications of affinity with *Acronycta*, are not near enough to be placed in the same family. *D. coryli*, I should certainly restore to its old place in the *Liparidæ*, to which it is far closer than to the *Acronyctas*. . . . But neither of them seemed to me to be nearer to *Acronycta*

than is *Arctia* or *Liparis*, or *Orthosia*, or *Xylina*, which appear to be perhaps the families nearest to *Acronycta* in different directions" (Entom. Record, Vol. III., p. 249).

Dr. Chapman then gives (Ibid. pp. 249-251) a most exact and scientific description of the egg, the newly-hatched larva, and the larva after each change of skin, of *D. coryli*, annotating his description throughout by comparison with the *Lipariidæ* (or *Lymantriidæ*, as it appears to be called by American lepidopterists).

After thus exhaustively dealing with the structure of *Demas* in its various stages, Dr. Chapman concludes:—"The larva of *D. coryli* is clearly a Liparid, not, therefore, perhaps so very remote from *Acronycta*, but, still, distinctly a BOMBYX (if that name still has a definite collective meaning) and not a NOCTUA. The pupa of *D. coryli* is not that of a NOCTUA, though the character of the anal armature has some resemblance to various NOCTUA forms" (Entom. Record, Vol. IV., p. 97). The larva is excellently drawn and figured in the same volume of the magazine (Pl. IX., Fig. 2), where the newly-hatched larva is shown $\times 20$ diams., and compared with the Acronyctids, with which it has been suggested to have certain affinities. The pupa is also figured in the same plate (Fig. 5, pupa of *D. coryli*, nat. size; Fig. 5a, pupa of *D. coryli*, showing dorsal view of armature; Fig. 5b, pupa, showing ventral view; Fig. 5c, pupa, showing lateral view;—the three latter $\times 15$ diams.

It is clear that neither Prof. Smith nor Mr. Dyar have ever seen these excellent papers by Dr. Chapman. It is equally clear that it should be the business of every lepidopterist of repute to do so. One of the greatest complaints that I have to offer against critical writers on American lepidopterology is their general ignorance of British work. Surely the *Transactions* of our leading Entomological Societies and the leading magazines should be a part of every entomologist's monthly or quarterly pabulum. If they were, one would have to complain less of misunderstanding due to a want of knowledge of all the facts bearing on the case.

I trust if Mr. Dyar or Prof. Smith should be inclined to challenge the above facts, they will read Dr. Chapman's articles first. The above are necessarily brief excerpts, and the whole bearing of Dr. Chapman's position can only be understood by reading his complete essays.

A NEW COCCID FROM TEXAS.

BY T. D. A. COCKERELL, NEW MEXICO AGR. EXP. STATION.

Aulacaspis texensis, n. sp.—♀ scale circular, 1²/₃ mm. diameter, very slightly convex, dull brownish-gray or sepia-brown, becoming transparent at the edges; sometimes entirely whitish. Exuviae exposed, sepia-brown, not far from central, 1st skin to one side of 2nd, but wholly on it, with some white secretion extending over the centre of the 2nd.

♀ alive, plump, dull pale greenish-orange. When dead and dry dark yellowish-brown, remaining so when boiled in soda. Outline circular, pygidial portion striated; anal orifice rather small, as far behind level of caudolateral groups of glands as they are behind cephalolateral. A marginal row of 3 or 4 longitudinally elongated pores; and a sub-marginal row of pores, the two caudad longitudinally elongate, the 3 cephalad small and round; 5 groups of ventral glands, caudolaterals 10, cephalolaterals about 16, median about 8. Median lobes wide apart, with a slight prominence between them bearing a pair of small spines. Median lobes oblique, much as in *A. bromeliæ*, but the long inner slope convex, with 5 very distinct serrations, counting the one which forms the tip; outer short margin with one serration. Immediately outside each median lobe, and touching it, is a spine-like plate, its tip about or hardly on a level with the tip of the lobe. Then comes a very small and low, strongly bifid 2nd lobe, then a spine, then a rather large spine-like plate, then a very low and broad trifid lobe (one might almost as well say 3 serrations on the margin), then a spine, then a spine-like plate, then two serrations, and a very rudimentary third (sometimes all three obscure), then another spine-like plate, and after a short interval another, then after a short interval a pointed prominence followed by a notch, then 3 spine-like plates at rather long intervals.

♂ scale 1 mm. long, white, tricarinate, but the lateral carinae rather feeble; exuviae very pale ochreous. The ♂ scales occur in patches on the leaves, much as in *Chionaspis exercitata*, Green.

Hab.—San Antonio, Texas, Nov. 27th, 1895, on both sides of leaves of *Sophora secundiflora*. [C. H. T. Townsend.]

The species was first collected by Mr. Schwarz; and afterwards Messrs. Howard, Schwarz, and Townsend found it very abundant near San Antonio. The plant was determined by Mr. Coville. This is the first native North American *Aulacaspis*.

PHOTOGRAPHS WITHOUT SHADOWS.

A large percentage of the half-tone reproductions from photographs, for illustrating Experiment Station Bulletins, are greatly reduced in value because of a lack of detail caused by heavy shadows, resulting from the use of opaque backgrounds near the objects photographed. To overcome

this difficulty and to make such pictures of more value to specialists working in the fields of entomology, botany, and horticulture, a device, which is the outcome of combining several well-known principles, is here represented.

Many details can be easily photographed and reproduced by this arrangement which are usually obtained by pen and ink drawings, and the personal equation entering into such work is thus eliminated.

The salient features of this device are: no shadows, accuracy of colour values and form; details and time are saved. All these features are evident from a glance at figure 11, except, perhaps, the saving of time; but after a second thought, this is also obvious, as the objects to be photographed are simply laid on a horizontal plane instead of being fastened to a perpendicular surface.

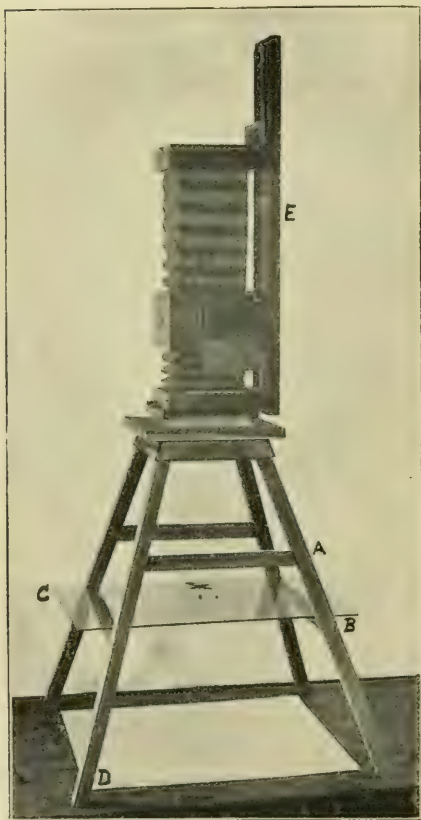


FIG. 10.

Dr. Holland, of Pittsburgh, Pa., a Lepidoptera specialist, on a recent visit to our Station, saw the arrangement and was much pleased by the advantages it offers to any of his plans for obliterating shadows in photographing butterflies and moths.

Pictures being more easily understood than descriptions, we have made a photograph of the outfit shown in figure 10, and also one showing a butterfly taken with the device, figure 11.

The apparatus consists of a four-legged stool, in this case $2\frac{1}{2}$ feet high, with an opening in the top and a copying camera placed over the hole. A pane of glass (C) is now placed on the upper or lower rounds of the stool (A or B), according to the distance you wish your object to be from the lens. The objects to be photographed are placed upon the glass, and for a background a sheet of paper or other material is laid on the floor (D) under the glass. In this case a white background is used because the butterfly is principally of a dark colour. By a glance at figure 11 you will see that the objectionable shadows are obliterated.

In photographing pinned insects it is necessary to have some scheme for holding them on the glass in the position desired. This is easily done by gluing a small piece of cork on the glass surface in which to insert the pin holding the insect. It is necessary to have the cork small enough so that it does not protrude beyond the specimen when looked at through the camera.

This device can be easily modified to suit an ordinary view camera by simply adding a piece of board to the top of the stool and letting it extend in a perpendicular manner similar to E in figure 10. By having a hole in this board one can fasten a camera in place with a thumb-screw, precisely as it is fastened to a tripod, with the exception that the lens is directed downward.



FIG. 11.

W. EARL RUMSEY,
Asst. Entomologist.

West Virginia Agr. Expt. Station, Morgantown, West Va.

A NEW TYPHLOPSYLLA FROM MEXICO.

BY CARL F. BAKER, FORT COLLINS, COL.

Belonging to that group of the genus having head combs arising in front of the antennal grooves in a line nearly perpendicular to the long axis of the head, instead of along the lower margins of the cheeks, and which includes the two species *gracilis* and *fraterna*.

Typhlopsylla mexicana, n. sp.—Female. In form resembling *T. musculi*. Head rather strongly pointed, face receding. Bristles on head numerous, strong and spine-like, one on either side of extreme tip, short

and stout. Antennal groove open, spines on second joint equalling tip of joint 3. Head comb of four short, heavy spines, their tips very obtuse and sides nearly parallel; the second from above reaching as far back as tips of antennæ, and slightly longer than the others, which are nearly equal in length. Maxillæ very acute, rather broad at base. Maxillary palpi stout, the joints decrease in size in the following order: 1, 4, 2, 3, the third being shortest, the fourth narrowed to a slender tip. Mandibles reaching two-thirds length of anterior coxæ. Pronotal comb of twenty-two close-set spines. Bristles on dorsal abdominal segments in two rows, the second of ten to fourteen long and strong bristles, on ventral segments in single rows of four to eight similar bristles, the tuft on apical ventral segment rather large. Legs rather strongly spined, close-set even rows of spines on posterior margins of all tibiæ being especially conspicuous. Apical spines on hind tibiæ extending nearly two-thirds the length of first tarsal joint. In middle tarsi joint 2 equals 5, 3 is half of 1 and three-fourths of 5, 5 is twice 4. In hind tarsi joint 1 is as long as 2, 3, and one-half of 4 together, and about three times the length of 3, 2 equals 4 and 5 together, 3 nearly equals 5. Colour pale brownish. Length 2.5 mm.

Described from a single female taken from "*Mus rattus*" at Guanajuato, Mexico, by Dr. Alf. Duges. This very distinct species is easily separated from either *gracilis* or *fraterna* by the above description.

BOOK NOTICE.

Mittheilungen aus dem Roemer-Museum, Hildesheim. No. 3.—Januar, 1896. DIE APATELIDEN, von A. Radcliffe Grote, A. M. (Mit 2 photographischen Tafeln und 3 Zinkographien im Texte.)

Mr. Grote here defines the family Apatelidæ and gives a list of the species which can be referred to it with reasonable certainty in the present state of our knowledge. The subdivision of the genus *Apatela* on larval and on pupal characters is discussed at some length, and 15 subgeneric names are recognized, including both European and American species. Two of these names are new, and one new species is described, *Panthea portlandia*, Grote. The two plates represent a number of typical European Apatelidæ. The moths are excellently done, but the larvæ are only imperfectly shown, as their cylindrical bodies fail to focus sharply in the photographs.

This paper may also be consulted for a concise statement of the classification of the Lepidoptera on larval characters (page 3), and a continuation of the discussion of the generic term *Noctua* (p. 4).

HARRISON G. DYAR.

The Canadian Entomologist.

VOL. XXVIII.

LONDON, APRIL, 1896.

No. 4.

A CONTRIBUTION TO THE KNOWLEDGE OF NORTH AMERICAN SYRPHIDÆ.

BY W. D. HUNTER, ASS'T IN ENTOMOLOGY, UNIV. OF NEBRASKA.

[The material mentioned in this paper (with the exception of the type of *Chilosia Townsendi*, n. sp., from the collection of the Cal. Acad. of Sciences) is in either the collection of the University of Nebraska or of Prof. C. W. Johnson, of Philadelphia. In each case I have taken care to mention in which one of these the specimens may be found.]

Callicera Johnsoni, n. sp.

Male.—Eyes contiguous for about two-thirds their width above, densely long, white pilose, with a sharply defined vertical black band about one-fifth their width; above, the two bands are confluent. Occiput shining olivaceous, white pilose. Ocellar area with a tuft of ferrugineous pile. Spot above the antennæ bare, shining black. Face shining black, except the tip of the indistinct tubercle, which is opaque; covered, except an indistinct median stripe, and more densely below, with abundant long light yellowish pile; very indistinctly concave below the antennæ. Cheeks shining olivaceous, except an anterior velvety cross-band and an indistinct spot below the lowest margin of the eyes; long yellow pilose. Palpi clavate, testaceous at base, apical half black. Antennæ entirely black, with short stiff black hairs on the first and second joints; first joint cylindrical; second expanded at apex, less than half as long as the first; third joint bare, over twice as long as the first and second together, expanded on basal half, flattened, bent outwardly at middle. Style short, obtuse. Thorax: dorsum shining olivaceous, with five opaque, very indistinct, longitudinal bands; pile obscure yellowish, abundant. Pleura shining, with more distinctly yellow pile. Wings a trifle tinged with yellow anteriorly, veins testaceous. Anterior cross-vein distinctly before the middle of the discal cell. Last section of the fourth vein with the first third straight, distinctly sinuate inwardly. Tegulæ white, ciliate. Abdomen entirely covered with moderately long yellowish-white pile; first segment entirely opaque; second, except a broad cross-band, expanded medially into a large triangle, the apex of which reaches

the anterior margin, shining olivaceous ; third segment entirely shining. Legs : femora, except the extreme tips, black ; long white pilose ; tibiæ testaceous at base, at apex ferrugineous. Tarsi ferrugineous, darker at tips. L., 10½ mm.

One specimen [Fairmont Park, Philadelphia, Pa.], collected by Mr. Chas. I. Greene and kindly transmitted to me by Prof. C. W. Johnson, of the Wagner Institute of that city, to whom I most respectfully dedicate it.

This species differs from the European *C. ænia*, Fabr., to which it is allied, in the markings of the abdomen, the absence of the "snow-white style," the general dull colour, and in several other respects ; from the only other described North American species, *C. montensis*, Snow, in not having the face and front black pilose nor the thorax and abdomen golden pilose. Mr. Snow writes me that he has never observed any variation in the colour of the pile in *montensis* at all. There are other differences in the coloration of the antennæ and legs and in the form of the fourth vein.

The capture of this insect is deemed worthy of more than passing notice. The species of *Callicera* are found almost exclusively near the tops of mountains. The only species up to the present time found outside of Europe was *C. montensis*, Snow. The three type specimens were taken on the top of Mt. Deception, in Colorado, at an altitude of 9,000 feet. Later, two more specimens were taken on one of the peaks of the Magdalena Mountains, in New Mexico, at an altitude of 9,500 feet, also by Snow. The species was described by Snow, in Kansas Uni. Quart. Vol. I., p. 33 ; July, 1892.

In Europe, as far as I have been able to ascertain, there is only one record of the capture of a *Callicera* except on a mountain top. Prof. Stein has this note in the Berlin Ent. Zeitschr., 1860, 325 [translating]: "*Callicera fulva*, Schaum.—I captured a female of this species on the first of June, in the vicinity of Frankfurt-a.-d.-O. It was resting on flowering *Spartium scoparium*, which was, perhaps, only accidental. A thorough search of the same place eight days later yielded no result."

The present is, therefore, the second record of the capture of a species of this genus at a remarkably low altitude, the altitude in this case being considerably lower than that of Frankfort-on-the-Oder, which is about 125 feet. Fairmont Park lies on both sides of the Schuylkill River, adjoining Philadelphia on the Northwest, and probably in no place exceeds an altitude of sixty feet.

The occurrence of the first discovered specimen of this European genus in the western part of North America was another verification of the well-known biological law that European forms are more likely to occur in the western than in the eastern part of this Continent, as pointed out by Snow. It is clear now, however, that since two species have been discovered, one eastern and the other western, and the eastern as closely related to the typical European forms as the western, that any such conclusion in regard to this genus is no longer valid.

Microdon fulgens, Wied.

This species was included in Williston's Synopsis of N. A. Syrphidæ, on the authority of Wiedemann, who described the species, Aussereuropæischen Zweifl., Insecten 82 (I.), from a specimen "In Berliner Museum, aus Neugeorgian," and on Macquart's statement, Dipt. Exot. Ier. Suppl., 122, of habitat as Florida and Guiana. Wiedemann's short, terse description is abundantly sufficient to separate it from its congeners. It is as follows :—

"Antennæ black. Face steel-blue, thinly yellowish-white pilose. Thorax golden-green ; in certain reflections there appear copper-coloured stripes. Ante-alar callosities (Vorflügeldreieck) steel-blue ; front between green and blue-metallic. Wings nearly pure brown, on the thin veins only brownish ; tegulæ white with a black ciliate border. Legs green or blue" [translation by Williston].

The front is mixed white and black pilose, front and middle tarsi opaque black, pulvilli light yellow. Scutellum very broad, the posterior margin almost parallel with the anterior; the spines distinct. The outer cross-veins are distinctly sinuate.

One specimen, a female [St. Augustine, Florida; Prof. C. W. Johnson], now in the collection of the University.

The robust form, entirely metallic colour, black antennæ, and large size are such as to make the species unmistakable.

Chrysotoxum derivatum, Walker.

This genus is a very difficult one, and much confusion prevails even in Europe as to the limitation of the species. Even such structural characters as the comparative length of the antennal joints are of very little value, although such an authority as Schiner has used them. They all show a very great resemblance in coloration, and the species are very variable. In Europe there are about fifteen described species, and in this country ten, one of which must be dropped on account of the imperfect description.

The material in the University collection contains numerous specimens that must be *C. derivatum*, but it is only by a process of elimination that this conclusion can be reached. As Mr. Snow states of other specimens: "They seem to belong here, however, better than elsewhere." These specimens were taken in extreme North-western Nebraska, and in the Big Horn Mountains, in Wyoming. They exhibit all the variations in the markings of the abdomen that Snow has mentioned (Kans. Uni. Quart. Vol. I., 35). Besides these, there are three specimens of both sexes—two taken at Lincoln and one at Harvard, Nebraska—that differ as follows: The anterior margin of the wings is only very lightly tinged with yellow, whereas in the others they are always very distinctly so; the abdomen is covered with erect, light-coloured pile, while in the mountain specimens it is provided with only very short black hairs; the median stripes of the thorax are very distinct, while in the others they are obsolete or entirely wanting; the four anterior femora are entirely yellow, while in the others there is a distinct black spot near the base. From this I conclude that these specimens are of a different species, which I am quite certain is *pubescens*, Loew, although the only differences in the descriptions of these two species are that in one there are distinct dorsal vittæ and the wings are tinged with brown anteriorly, while in the other these points are not mentioned, and hence, may or may not be present. But from a study of this material, part of which must be *derivatum*, I am certain that *pubescens* and *derivatum* are both good species, and should stand, no matter how many of the other species of this genus must fall. I am thus enabled to give the following amended descriptions of the two species.

C. derivatum, Walker.

Second joint of antennæ one-fourth to one-half as long as third, sometimes shorter than the first; arista yellowish. Thorax with the median vittæ at all discernable only in the female. Abdomen everywhere covered with short sparse black hairs. First segment black, second lateral margin black, except sometimes the posterior corners, the yellow band is very distinctly interrupted, the two parts arcuate and often expanded medially, posterior margin black. Band of third segment more equal in width than first, interrupted or entire, not always reaching the lateral borders, which are mostly black; entire posterior margin expanded in the middle, yellow. The black markings of the fourth segment vary from an anterior uninterrupted band, expanded to include most of the

lateral borders, and a complete arched band in the middle of the segment to a very narrow anterior band, sometimes interrupted in the middle, and not including all of the lateral margins, and an indistinct middle spot with a very slender, elongate spot at each side of it. On this segment the yellow posterior margin may be entirely separated from the anterior band, but usually they are confluent at the corners. Fifth segment with an anterior black band, expanded to include more or less of the lateral margins, and a black spot like an inverted V or Y. Often this spot is obsolete, leaving only three small spots to form the outline of a V. Legs yellow. All the coxæ, and trochanters, and a distinct shining spot at the base of each of the four anterior femora, black. Posterior tarsi tinged with reddish. Wings very distinctly brownish (less so in the female) on anterior third.

C. pubescens, Loew.

Very much like *derivatum*, but differing in having the legs entirely yellow, the abdomen everywhere covered with erect yellowish pile, and the median thoracic stripes distinct. The wings are much less distinctly marked with yellow. Second joint of antennæ longer than first; third joint in female about equal to the first two; in the male it is slightly longer. Abdomen marked like that of *derivatum*, except that the posterior margin of the second is always yellow, and the anterior corners of segments three and four are reddish. The black mark on the fifth segment is like an inverted V or Y; or the branches may be arcuate.

Psilota buccata, Macquart [Dipt. Exot. II., 2, 107, pl. xviii, fig. 2].

The history of this species and its attribution to the United States is as follows: It was described by Macquart, in the Memoirs of the Society of Arts and Sciences of Lille in 1841, and the locality given as "Carolina." It was here placed in the genus *Pipiza*. In the fifth supplement to the Dipt. Exot., which was published in 1855, Macquart describes a species, *flavidipennis*, for the first time under the genus *Psilota*, which was founded by Meigen, in his Syst. Besch. III, 256, in 1822, several years before the other species, *buccata*, was described under the genus *Pipiza*.

In 1862 Dr. Loew, in the Monographs of the Dipt. of N. A., I, 27, in mentioning the various genera of *Syrphidæ* that have been recorded from North America, states that Macquart has recorded a *Psilota* from North America, but that, as that genus had been misunderstood by most authors, he would not venture to mention it among those truly represented in N. A. The reference mentioned above was undoubtedly his authority for this statement.

The next step comes in 1878, with the appearance of Osten Sacken's second edition of his Catalogue of N. A. Diptera. In that he includes *Psilota flavidipennis*, Macq., giving the author's habitat, Philadelphia, and calling attention to the note by Loew just referred to. It is very certain that if he had found the species in nature, he would have mentioned the fact. We must hence conclude that he had not, and included it simply on the authority of Macquart, which makes it very uncertain that the species is North American at all up to this date.

Between this time and the time of the publication of Williston's Synopsis it is evident that some specimens were captured in this country. For Williston states that he found two specimens in the Loew type collection which were labelled *Psilota flavidipennis* at Cambridge. Hence, it is certain from this time on that this species is a North American one, and that Macquart's locality was probably correct, as was his determination.

Now, Williston states that he has no doubt that these specimens so labelled are *buccata*, but that they are *flavidipennis* is doubtful. In other words, he thinks that the correct determination of the specimens is as *buccata*, and that Macquart's other species, *flavidipennis*, may or may not be the same as that species. Hence, in his Synopsis he places Macquart's description of *flavidipennis* along with that of *buccata*, as revised after an examination of the specimens at Cambridge.

Without assuming that my opinion will settle the matter at all, I may say that it seems that they are two distinct species. The colour of the legs and of the abdomen is quite different. The two specimens from Georgia that Williston mentions [Syn. App., 292] may and may not be the true *flavidipennis* of Macquart. It is very doubtful. The less shining abdomen would seem to favor the conclusion that they are, while the more concave face would point to an opposite conclusion.

There are known in collections specimens of this species as follows: In the Loew type collection, at Cambridge, two specimens; in the U. S. National Museum, eight specimens, six from Texas and two from Georgia; in Mr. C. W. Johnson's collection, at Philadelphia, several specimens from Texas; and in the collection of the University here, one specimen from Blanco County, Texas;—this specimen has the pile everywhere pure white.

Chilosia prima, n. sp.

Female.—Eyes and arista bare (when magnified twenty diameters, the arista shows distinct hairs). Face not pilose, scutellum without distinct marginal bristles; legs almost entirely yellow.

Front distinctly trisulcate, sparsely punctured, shining black, with moderately long whitish pile more abundant between the lateral sutures and the eye margin. Occiput opaque, white pubescent, except near the eye margin, where it is shining olivaceous and pilose. Face shining black; viewed from in front, covered, except broadly on the tubercle, with very fine pubescence (viewed from the side it appears bare); very deeply concave below the antennæ and indistinctly so below the tubercle, with a few short hairs between the facial sutures and the eyes. Tubercle round, subacute, shining, much more prominent than the antennal elevation, situated below the middle of the face. Epistoma not projecting, in profile obliquely truncate at apex, lower margin straight and horizontal. Cheeks narrow, coloured and provided with pile like the face. Proboscis large, flabellate, dark ferrugineous; palpi cylindrical. Antennæ and narrow margin of the orifices bright reddish-fulvous, first joint slightly darker, second with a few short dark bristles, third joint somewhat longer than broad and a little flattened above and below, large and nearly oval. Arista basal, black, micro-pubescent, not incrassate. Humeral callosities ferrugineous, inwardly silvery pollinose. Dorsum slightly metallic, sparsely punctured, more coarsely so posteriorly, with sparse erect light yellow pile. Pleura shining olivaceous, with very sparse whitish pile. Scutellum coarsely punctured, black, rather long pilose and with slightly stronger hairs on the border. Abdomen robust, distinctly expanded on segments two and three, sparsely but distinctly punctured, with short sparse yellowish pile, everywhere shining except a broad median stripe on the second segment. This stripe has a small shining area in its middle anteriorly. There is a general, almost indiscernable, purplish cast to the abdomen. Venter shining, polished anteriorly, light yellowish pilose, the apical margins of the segments reddish. Legs light fulvous, with moderately long whitish-yellow pile; middle and posterior coxæ black; the apical joint of all the tarsi, and a large spot on the outside of the posterior tibiæ, brownish. Claws black, pulvilli whitish. Wings hyaline, veins testaceous, apical cross-vein parallel to the margin of wing, meeting the third vein at an acute angle. Tegulæ and narrow base of the wing distinctly yellowish. Long. corp., 11 mm.; L. alae., 8.5 mm.

One specimen [Philadelphia, Pa., 9-4-91], collected by Prof. C. W. Johnson. The type is now in his collection.

This species falls in the group with bare eyes and arista, which includes as North American species, *capillata*, Loew; *comosa*, Loew;

nigripennis, Will. ; *versipellis*, Will. ; *parva*, Will. ; *leucoparea*, Loew ; *tarda*, Snow ; and *lucta*, Snow. From all these, except *parva*, Will., it is easily separable by the colour of the legs, which are almost entirely yellow. From *parva* it is separable by the abdominal markings as well as by the much larger size.

Chilosia Townsendi, n. sp. [To Prof. C. H. Tyler Townsend.]

Male.—Eyes bare, arista very long plumose, face not pilose, scutellum with very distinct bristles, third joint of antennæ quadrangular, one and one-fourth times as long as broad, slightly concave above, the angles scarcely rounded.

Pile of vertex long, black. Front unisulcate, very slightly shining, black pilose. Eyes contiguous for one-half their width. Antennæ small, ferruginous, apical third of third joint darker. Arista situated at extreme base of the joint, obscurely reddish, long plumose except at the extreme apex. Face covered, except broadly on the tubercle, with short appressed whitish pubescence, everywhere slightly shining, in profile distinctly concave below the antennæ. Tubercle below the middle, very obtuse, more projecting than the antennal prominence. From tubercle to epistoma, which is projecting, deeply concave. Epistoma beneath almost horizontal, in front obliquely truncate. Cheeks coloured and pubescent like the face, narrow with a transverse sulcus in the middle. Occiput olivaceous dull silvery pollinose. Proboscis very small. Humeri obscurely reddish-white pubescent. Dorsum subopaque on the side, shining, with erect black pile which grows into bristles posteriorly and laterally. Pleura shining olivaceous with erect yellowish pile. Scutellum shining, finely punctured, with very long distinct bristles on the margin and a fringe of white pile below, elsewhere it is black. Abdomen with sides nearly parallel, laterally with dense, bushy pile, which is white, except at the posterior corners of segments three and four. On the top the pile is sparse, black in the middle and yellowish at the sides. First segment entirely, narrow anterior margin of the second and third, shining metallic, fourth segment everywhere shining, but less metallic. Hypopygium shining, white pilose. Venter distinctly punctate, obscurely reddish laterally ; first segment shining white pilose and pubescent, second opaque with mixed black and white pubescence, third shining, black pubescent, and with very narrow posterior margin reddish. Legs black, mixed black and white pilose, all the trochanters, coxæ and narrow base and apex of the femora, posterior tibiæ except a wide median annulus and their tarsi

except the first and last joints, reddish; anterior and middle tibiae except wide median annulus and their tarsi except the apical joint, yellowish. All the femora have a fringe of strong black hairs on the apical portion of the posterior side. Claws, except their apical half, reddish. Wings long, everywhere tinged with brownish: veins all brownish. Long. corp., 10 mm; al., 9 mm.

This species is very closely allied to *C. tristis*, Loew, but is easily separable from that species by the colour of the antennae and the form of the third joint, which is not at all "subrotundo," as well as by several other characters.

One specimen [Marin County, California: Haines], in the collection of Cal. Acad. of Science. It was kindly transmitted to me for examination by Mr. Chas. Fuchs, through the courtesy of Mr. H. H. Baer, of the Academy.

This specimen is the identical one referred to by Mr. C. H. Tyler Townsend, in the Proc. Cal. Acad. Sci., Ser. 2, Vol. IV., 611, under the head of *Chilosia*, n. sp.?

Allograpta fracta, O. S. Western Diptera, 331, 1877.

The type of this species, a single male, was captured by Baron Osten Sacken, at Santa Monica, California, February 20, 1876. Since then no record has been made of its capture. In the collection of the University of Nebraska is a single female specimen captured at Los Angeles, California, November, 1887, by Prof. Bruner. It differs in no respect from Osten Sacken's description of the male. The front is yellow laterally and the first segment of the abdomen has the sides as well as the anterior margin yellow.

It is quite a remarkable fact that of the two specimens of this species known in collections, the latter one was captured in exactly the same locality as the type, though eleven years later.

Mesogramma parvula, Loew.

This species has been recorded from Florida and Georgia only. There is a male specimen in the collection of the University, labelled Orizabo, Mex., Jan., '92; Prof. Bruner. It agrees exactly with the description, except that the black of the second segment of the abdomen is entirely shining and that the third and fourth segments have the black markings very obscure, but like the typical ones in outline. Two other specimens from St. Augustine, Florida, collected by Mr. C. W. Johnson, of Philadelphia.

A careful study of this material seems to make it clear that *M. Boscii*, Macq., and *M. parvula*, Loew, are one and the same species. Absolutely the only differences in the descriptions of these two species are in the markings of the abdomen, and they are notoriously variable in the species of this genus. In *Boscii* the first segment is black and the anterior half of the second is yellow; in *parvula* the anterior margin of the first segment is yellow and the anterior margin of the second is black. Now, one of these specimens shows a very narrow yellow anterior margin on the first segment, and the other specimen has it entirely black, but in both the second segment is black on the anterior margin. Such a combination of the only characters that separate these species in individual specimens seems to make their identity certain.

Mesogramma marginata, Say.

One specimen from Orizabo, Mexico; Jan. This species has been recorded from all parts of the United States and from several points in Mexico.

Baccha Tarchetius, Walker.

There has been recorded only one specimen of this species besides the type in the British Museum; this one was from New Jersey [Mr. Keen] and is now in the National Museum. In the collection of the University are two specimens—one from Philadelphia, Penn., and the other from Mobile, Ala.—both taken by Mr. C. W. Johnson, and from his collection. They are both females and differ from the description of the male in having two yellow spots similar to those on the third segment on the fifth. In all other respects the description applies exactly.

Baccha clavata, Fabr.

This species is a common one in the Southern States. It has been recorded from Georgia, Florida, Arizona, and two localities in New Mexico; Schiner mentions it "aus Süd-America." The capture of a specimen at Lincoln is therefore quite remarkable and gives the species a very much enlarged range. This specimen, a male, was taken near the flowers of a species of aster growing near the water, in September, by the writer. The larva of this species is a very beneficial one in districts where oranges are grown, as it feeds on the aphids that often infest the trees.

Baccha notata, Loew, *Diptera Americae septentrionalis*, Cent. VII., 65, 1861.

MALE.—“OCHRACEOUS; VERTICAL TRIANGLE AND SPOT ON THE FRONT, BLACK; DORSUM OF THORAX, EXCEPT LATERAL BORDER, DARK OCHRACEOUS, MARKED MEDIANLY WITH A GREENISH-BLACK STRIPE; ABDOMEN WITH DARK LINES; WINGS INFUSCATE, TOWARDS COSTA LUTESCENT.

“Head luteous; occiput cinereous; vertical triangle black; front opaque, black pilose, and with a minute black spot; frontal lunule naked, near the antennæ black. Antennæ ochraceous. Face light ochraceous, semi-transparent, entirely shining. Thorax ochraceous; dorsum, except the wide lateral margins, dark fuscous, with two median lines abbreviated posteriorly and double lateral marks shining virescent. Scutellum ochraceous; metanotum bronzy-black; pectus marked with black. Abdomen ochraceous, with fuscous longitudinal lines; hypopygium bronzy-black. Legs ochraceous; apical third of posterior femora and posterior tibiæ, except a wide subbasal annulus, subfuscous. Wings infusate, towards costa yellowish; marginal and apex of the submarginal cells distinctly coloured with fuscous.” [Translation.]

One specimen, a male, agrees in almost all respects with Loew's description. The coloration of the wings is much less marked, however. They are subhyaline, iridescent, costa tinged with testaceous. The posterior femora are testaceous except a dark annulus on apical third; the posterior tibiæ except basal third are dark. The abdomen is furnished with moderately long light pile, especially on the first and second segments. First segment, except a broad, uninterrupted band on posterior margin, yellow; second segment fuscous subtranslucent with a distinct light band just beyond the middle; remaining segments yellow, except the lateral margin and four slender black bands slightly expanded at the apex. Third joint of antennæ very short; oval.

One specimen [Charlotte Harbour, Florida; Mrs. Slosson]. This species was described by Loew, in 1861, from a specimen collected by Gundlach, in Cuba. The present is the first record of its capture since that time and the only record of its occurrence in the United States.

My thanks are due to Prof. Williston for aid in determining this specimen.

Eristalis latifrons, Loew.

This is a very widely-distributed and common species in the West.

Snow has recorded it from five different localities in Colorado and from four in New Mexico. Besides this, it has been recorded by Williston, from California, Kansas, Arizona, Texas, and Mexico, and from the latter locality also by E. Giglio-Tos. In the collection of the University there are numerous specimens from Lincoln and West Point, Neb., Custer, S. D., Los Angeles, Cal., and Lerdo, Mexico. The three female specimens from the latter locality are not in the least different from the others.

Several female specimens that are not otherwise different have a very large spot of brownish in the middle of the wing. One female specimen from Lincoln, Neb., lacks the opaque spots on the third segment of the abdomen, as did several male specimens from California that Prof. Williston mentions.

Eristalis Brousi, Will.

There are specimens in the collection of the University from Hot Springs, and Custer, S. D., Soda Springs, Idaho, and Laramie, Wyoming. One female specimen has the spots on the second segment of the abdomen yellow and distinct, as Snow has observed in other specimens. This species has been recorded from Alaska to Colorado and to New England.

Eristalis montanus, Will.

A male specimen collected at Soda Springs, Idaho, by Prof. Bruner, agrees exactly with Williston's description, except that the eyes are distinctly contiguous, and that the black of the third segment of the abdomen is not contiguous with that of the second; the margin of the second segment posteriorly is yellow slightly tinged with reddish. The type specimen of this species, a single male, was captured at Como, Wyoming, at an altitude of 7,000 feet. The present is the only record of its capture since that time. A female specimen taken also at Soda Springs, at an altitude of 5,000 feet, on flowers near the water, in August, shows the following differences from the male, which have never been described: The second segment of the abdomen has the black as wide on the posterior margin as on the anterior; the posterior margin black, third segment mostly shining black, with sides broadly yellow, with an anterior spot and narrow posterior margin opaque; fourth like third, except no opaque spots; fifth entirely shining black. The front is black with yellow pile, and the vertex is black pilose. Otherwise it is exactly like the male.

Eristalis hirtus, Loew.

This is a very widely-distributed and common species all over the West. It has been taken at four different localities in Colorado, as well as New Mexico. The collection here contains numerous specimens taken at Custer, South Dakota.

Eristalis flavipes, Walker.

There are two specimens of this species in the collection of the University. One of them, a male, captured at Lincoln, Nebr., is a typical form; another, a male, captured near Lake Winnipeg, on the Saskatchewan River, in Canada, by Prof. Bruner, in September, is Loew's *E. melanostomus*, or, as it is now considered, *Eristalis flavipes*, var. *melanostomus*, Loew.

It is worthy of note that this species is predaceous, quite anomalously among the *Syrphidae*. The latter of the two specimens just mentioned was captured sucking the substance of a small grasshopper, *Chloëaltis curtipennis*, which it held in its grasp after the manner of many of the *Asilidae*.

Pteroptila cincta, Drury.

Two males and one female from Jamaica, W. I., have the abdomen and scutellum entirely of a strong reddish colour. The hypopygium is large and shining red. Collected at Portland, Jamaica, by C. W. Johnson, of Philadelphia.

Mallota cimbiciformis, Fall.

There is a specimen in the collection of the University taken at Milford, Nebr., in June.

There is another specimen that is very difficult to place. It was taken in War Bonnet Canyon, Sioux County, Nebr. Williston has described a species, *M. Sackeni*, that differs from *cimbiciformis* only in having the eyes separated in the male, and the wings marked with a distinct brown spot. There is perhaps also this difference, viz., that in *Sackeni* the marginal cell is closed in the margin, while in *cimbiciformis* it is distinctly open. Williston states, in litt., in reply to a letter in which I expressed some doubt as to the right of *M. Sackeni* to stand as a species: "The question of the 'art recht' of *M. Sackeni* is doubtful. I found specimens, however, from Mexico agreeing perfectly with the type specimen (a note of which I made in the Biol. Central Amer.), and thus continued the name. It is not at all improbable that the species runs into the older species, and that the name can only be used with a varietal meaning."

The specimen above mentioned has the eyes distinctly separated, and would hence fall into *M. Sackeni*. But the wings are not more distinctly marked than in *M. cimbiciformis*, the marginal cell is distinctly open, and the last segment of the abdomen is covered with long erect yellow pile, while in *Sackeni* the abdomen is entirely black pilose. These points together would seem to make it distinct from that species, although the very strong character of the eyes being separated would make it that. It differs from all the forms of *M. cimbiciformis* in the above-mentioned pilosity of the abdomen, and in the separation of the eyes. I have consulted almost a dozen different descriptions of *M. cimbiciformis*, which it is more than probable represent all of the different variations, and invariably the abdomen is described as entirely black pilose, except the first segment. There is a further difference in the form of the face below. After thus stating the case, and exercising all the care that should be exercised in erecting a new species in a genus where the synonymy is already immensely complex, I feel justified in describing the specimen as new.

Mallota facialis, n. sp.

Male.—Antennæ obscurely reddish, shining except the third joint, arista yellow. Wide facial stripe and cheeks shining. Face white pubescent and pilose, strongly projecting below, so that a line from the tip of the tubercle to the tip of the epistoma would have a distinct outward slant; the epistoma projects distinctly further than the antennæ [the outline of the face is quite different in the other species of this genus]. Eyes bare, very narrowly separated. Pile of thorax and scutellum bright yellow. Thorax black, scutellum translucent. First segment of the abdomen but little shining, whitish pilose; second and third segments shining, and everywhere covered with short, stiff black hairs; fourth shining bronzy, everywhere covered with abundant long, bright yellow pile. Legs black, all the tarsi, and tips of femora strongly and fore and middle tibiæ entirely and basal half of posterior tibiæ weakly reddish. Posterior tibiæ without spur. Wings very slightly marked with brown at the separation of the second and third veins.

One specimen [War Bonnet Canyon, in extreme North-western Nebraska].

Xylota analis, Will.

There are known specimens of this species as follows: In the U. S. National Museum, one male from Cala. [Baron], and two females from

New Mexico [Gauger], which form the types of the species; in the collection of the Kansas University, two males from the Magdalena Mountains, in New Mexico [Snow]; and in the collection of the University of Nebraska, one male, taken in War Bonnet Canyon in the extreme north-western part of Nebraska. This last specimen agrees exactly with Williston's description except that the antennæ are entirely red.

Xylota flavitibia, Bigot.

This species has been recorded from Colorado, by Williston, and from Colorado and New Mexico, by Snow. The collection of the University contains one male specimen taken in War Bonnet Canyon, Nebraska.

Xylota fraudulosa, Loew.

The collection of the University of Nebraska contains numerous specimens taken near Milford, Neb., in June, on the flowers of *Prunus americanus*. It has also been recorded from several localities in the East, and from Illinois, Wisconsin, and Washington, in the West.

Xylota augustiventris, Loew.

This species has been recorded from New York, Penn., and Ill., but not hitherto west of the Mississippi River. A single male specimen from War Bonnet Canyon, in extreme North-western Nebraska, has the wings hyaline, the third segment of the abdomen shining, except a very broad posterior band which projects almost to the anterior margin. The fourth segment is entirely shining.

Xylota obscura, Loew.

There is in the collection of the University of Nebraska, one female specimen taken in War Bonnet Canyon, Nebr. This species has been recorded from Oregon, California, and the Red River of the North. The description applies exactly.

Spilomyia quadrifasciata, Say.

One female specimen taken at Lincoln, Nebr., in September, by the writer. With the exception of the record of several specimens in Eastern Kansas, by Snow, this species has not been recorded outside of some of the extreme Eastern States. This specimen was taken on the flowers of *Aster multiflorus*.

Sphecomyia vittata, Wied.

In the University collection there are two specimens, one from Belmont, Nebr., and the other from War Bonnet, thirty miles distant. This species has been recorded from the Eastern and Southern States, and Minnesota and Colorado, in this country, as well as from localities in Northern Europe and Siberia.

PIERIS RAPÆ AND AGRAULIS VANILLÆ.

BY W. G. WRIGHT, SAN BERNARDINO, CALIFORNIA.

P. Rapæ, the introduced "European cabbage butterfly," on its westward march across this Continent, was first taken in Nebraska on August 3, 1881. (See CAN. ENT., 1882, 39.) In May, 1883, I took one male in Southern California. At that time I did not know its name, but I spread it and placed it in my cabinet as unknown. In a few years an Eastern Entomologist called on me, and at once identified it as P. Rapæ. It was yet other years before I saw another specimen in flight, though collecting diligently every season. About 1890 or '91 other specimens were observed, and thereafter every year brought them in rapidly increasing numbers, till now they are extremely abundant, flying early and late in the day, and early and late in the spring and fall, and at times, as in cold or cloudy weather, when only a very few of the native species can fly, indicating that it is more hardy than the native species, and that it will eventually dominate. As might be expected, the larvæ feed in good part on cabbage plants, but yet they are not at all dainty or particular as to food, and many other plants are used. Last year I raised some fine specimens from eggs laid on leaves of common nasturtiums, in the garden, and wholly fed upon those leaves.

The native Pierids, P. Protodice, P. Beckeri, and P. Sisymbri, do not oviposit on any cultivated plant so far as I know, preferring wild plants, while Rapæ apparently prefers cultivated ones. Evidently Rapæ will in a few years become a great pest. Already they fly in numbers everywhere, but especially about the Chinese vegetable gardens, and the flower gardens and dooryards of the towns.

Another introduced butterfly is that beauty from the Southern States, Agraulis Vanillæ. This species came into California over the Southern Pacific Railroad soon after trains ran through from Louisiana, or say in 1885. I well remember the first ones I ever saw. There were two of them in a front dooryard feeding on the flowers, and I was in a buggy driving along the street; but my net was handy, and I instantly went in pursuit of the red beauties, capturing them both as a first move, and explaining to the surprised people of the house afterward. Now Vanillæ is everywhere in evidence, and its larvæ are so abundant that large old passion vines are sometimes wholly denuded of leaves by them. Vanillæ is also extremely hardy and vigorous, flying, like Rapæ, at unfavourable times and seasons, as if bent on conquest. Still, it has not increased so rapidly during the last few years as has Rapæ.

These two species are the only ones as yet brought into the State from the East.

ON THE POSITION OF THE GENUS DEMAS.

BY HARRISON G. DYAR, PH. D., NEW YORK.

In the March number of the CAN. ENT., pp. 81-82, Mr. Tutt falls back upon the writings of Dr. Chapman to support his position for this genus as among the Liparidæ*. As Mr. Tutt has thus gracefully retired from the discussion without making a direct answer to my facts, I can only, in reply, briefly notice Dr. Chapman's position.

In the egg of *Demas*, Dr. Chapman, on a matter of detail, seems to imply an absence of relation with the Apatelidæ; but the fact remains that the egg is vertically ribbed as in the Noctuidæ, Apatelidæ, and Thyatiridæ, which I take to be the essential character. The Lymantriidæ, which belong to the Notodontian-Lasiocampid series have smooth, or obscurely reticulated eggs, the vertical lines having no tendency to become prominent.

In the young larva, Dr. Chapman has not discovered the peculiar arrangement of the warts, on which I lay special stress. He would ally *Demas* to *Liparis* on "the abundance of hairs and their length, the character of the tubercles, the anterior trapezoidal being more important than the posterior and the colouring." The hairs and colouring may be dismissed at once, as they are notoriously adaptive and variable characters. The statement about the tubercles is surprising. While it is correct of *Demas* as figured, the reverse is strikingly the case in many Lymantriids. The anterior trapezoidal (tubercle i.) in this group have a marked tendency to disappear, and I can only suppose that Dr. Chapman has made some mistake. His own figure of *Dasychira pudibunda* (pl. ix., fig. 8) shows the anterior trapezoidals clearly the smaller. The structure in *Demas* really tells in favour of my view.

In the second skin, Dr. Chapman describes a medio-dorsal depression on joints 5 to 11 and 12 "in the position of a peculiar organ in various Liparids." I see no good reason for the inference that these are the homologues of the dorsal eversible glands of the Lymantriidæ. In the first place they seem not to have any indication of the structure of such glands, and in the second place they are not homologous in position. In the Lymantriidæ, the glands occur on the 10th and 11th segments only; when others appear on the anterior abdominal segments, as in *Stilpnotia salicis* and *Lymantria dispar*, they are paired, not single.

*The name Lymantriidæ, as this family "appears to be called by American authors," was adopted by me from Mr. G. F. Hampson's Moths of India.

Dr. Chapman then remarks that in the further skin the larva has a more Liparid-like general appearance. The "appearance" is to me, however, not Liparid, but Arctian. When I first saw the larva, years ago, I took it for *Halisidota Harrisii*, till I noticed the different arrangement of the hair-pencils.

Next, he states that the habit of living between spun leaves is not that of an Acronycta. It is, however, decidedly so of our *Charadra deridens*, one of the Apatelidæ. But if *Demas* stood alone in this respect it would form no valid argument to remove it from the Apatelidæ, so slight and little specialized is the habit, evidently a recent adaptation.

As concerns the pupa, I do not pretend to be so conversant with the subject as Dr. Chapman is, and therefore his positive statement that "the pupa of *D. coryli* is not that of a Noctua" is entitled to consideration. However, I do not find the statement in "The genus Acronycta and its allies," a little book containing reprints of these articles, kindly sent me by Dr. Chapman, nor do I notice the positive characters which would lead to such a conclusion. Indeed, Dr. Chapman admits that "the character of the anal armature has some resemblance to various Noctua forms." But, indeed, suppose that the pupa be really "not that of a Noctua," the fact could only be applied to this discussion if it were shown that the pupæ of the other Apatelidæ were true Noctuæ pupæ, since it is equally true that the larva of *Demas* is "not that of a Noctua"; but neither are those of any other Apatelidæ. Now, Dr. Chapman says, speaking of the pupæ of the genus *Apatela*: "The pupa is less characteristic [than the larva]; it serves rather to divide the genus . . . than to define the group as a whole. The pupa of the *rumicis* group is very characteristic and rather bombyciform in its aspect. The others are more of an ordinary Noctua pattern, but present features that separate them from other families. This is a somewhat rash statement to make, since I must confess my knowledge of Noctuæ pupæ is of a rather superficial character."

These are all the points which I can gather from Dr. Chapman's account, and I do not think that they go far to refute my position, drawn from positive structural characters in the larva. Indeed, I should not feel called upon to criticise Dr. Chapman's interesting and valuable papers, except to examine the grounds of Mr. Tutt's position.

SOME ARGYNNIDS OF PARK CITY, UTAH.

(Elevation, 7,000 feet.)

BY ARTHUR J. SNYDER, EVANSTON, ILL.

Any time before the middle of June, entomological studies in the mountains are apt to be interrupted by snowfalls; but from that time to September, one will seldom find a better or more interesting place for study. The climate is delightful, and though the common opinion is that no rain falls upon the great plateau, here as elsewhere, suppositions are not facts.

My brief experiences (covering portions of two summers) would indicate that Utah receives as much rain during July and August as the State of Illinois. During the latter month, in 1893, there were frequent showers, and at least two heavy rains. In July, 1895, we experienced a very rainy day, and several showers. Nevertheless, at times it becomes so dry on the mountains that one must seek the low, irrigated meadows to find butterflies abundant.

The genus *Argynnis* is well represented in the West and North-west. From low lands to an elevation of 9,000 feet one finds many representatives.

The most striking species, as to colour and size, which I have found there is *A. leto*. This insect must be seen alive to be fully appreciated. Whether seen on the wing, or resting on a thistle blossom, it is a prize well worth the collector's attention. It appears in Utah (Park City) early in July, and its numbers gradually increase, until in August it may be called almost common. As is so frequently the case, the males appear first, and were found in the ratio of ten to one as compared with the females.

Mr. Maynard says *Leto* is found in California, Nevada, Oregon, Washington, and Montana. It has been my good fortune to capture it in Utah, Idaho, and Wyoming. I do not know how far East it has been taken, but my friend, Mr. William S. Bates, took several specimens of a female *Argynnis*, which I am satisfied are *Leto*, in Michigan during the past summer, and I have heard that it has been taken in Minnesota. I have never read that the female of *Leto* is dimorphic, but would not be surprised to learn that it is, or that *Leto* and *Cybele* are, or were at some time not far distant, one and the same species.

It is not difficult to secure eggs of *Leto*, and were it not for the fact that the larvæ hibernate, there would be no difficulty in rearing the

species. I believe Mr. W. H. Edwards has done so. Females confined over fresh violets oviposited readily, and in 1893 a number of larvæ were brought to Illinois, and subjected to "the cold-storage process" for the winter. In the spring, however, they failed to awaken from their lethargic condition.

A. eurynome was very common on low lands near Park City. At least 600 were taken in 1893. In one open meadow covered with flowers there were thousands of this species. Two forms or varieties were found, the ordinary one with silvered spots below, and a variety with all the spots below yellow. The ratio was about one yellow form to twenty-five of the silvered. A remarkable fact was noted. A silvered ♀ and a yellow ♂ were taken in *coitu*; a yellow ♀ and a silvered ♂; a silvered ♀ and a silvered ♂, and also a yellow ♀ and a yellow ♂. I am *positive* of all the statements except the last concerning the yellow ♀ and yellow ♂.

We know that peculiar specimens are sometimes the result of hybridism. Melanism may result from cold, drought, etc., and almost everyone has seen "sports" in the insect world.

I await with interest the results of future study concerning these subjects. It is commonly asserted that hybrids are never fertile. Is this *known* to be true?

A. myrina was abundant in the meadow mentioned above, but I do not remember having seen it elsewhere in Utah.

A. epithore was found on low ground flitting among the leaves of a large canna-like plant. One specimen also was taken beside a small mountain stream.

A. kremhild was taken in the same locality.

A. egleis was taken on a hillside near town, in an open spot, where the sun's rays seemed to linger at eventide, but near the underbrush where it was easy to escape among the scrub oaks and sage bushes. In its habits it much resembles *A. coronis*.

A. coronis was rare at Park City, but more common in the mountains, near Salt Lake City and Ogden.

A. Nevadensis and *A. Meadii* were also rare at Park City, but more abundant near Salt Lake. In habits they were quite unlike *coronis* and *egleis*, always being found on the flowers or else crossing swiftly to some place where flowers were more numerous, never dropping to the ground and flitting below the sage bushes, but seeking escape in swift flight. They also seemed to prefer lower ground,—the valleys instead of the hillsides.

A. montivaga.—One specimen taken.

A. Edwardsii.—Only one specimen taken.

A. liliana.—Only one specimen taken. Mr. W. H. Edwards says that the *A. coronis* and *A. nevadensis* taken in Utah are larger than ordinary. To my mind the *A. coronis* taken in Utah are unlike those taken in Colorado, both as to size and colour, but I have seen very few of the Colorado specimens.

In my collection are a number of *Argynnis* which seem to be unnamed.

For identification of specimens I am indebted to Prof. G. H. French, Dr. Henry Skinner, and Mr. W. H. Edwards.

My studies of this group lead me to believe that it sadly needs revision; that when it is studied carefully by someone who has facilities for comparing all the species and varieties described, many so-called species will prove to be synonymous; that when all the species have been bred and the stages studied, some surprising truths will be unearthed.

With a collection containing thirty-five species (?) and several varieties (?), I am willing, for the present at least, to say "don't know" to many things concerning the genus. I am anxious to find out something and contribute my mite towards unravelling the remarkable tangle.

LUNA EGGS—A CORRECTION.

Mr. Dyar kindly points out that the eggs mentioned by me on page 79 of the March number are not those of *Actias Luna*, as stated, but are those of *Telea Polyphemus*. He adds that "Luna eggs are quite different, being almost entirely black, and laid in little clusters on the twig, not on the leaf." Not having bred these moths from the egg, I had to rely on such descriptions as were at hand. Rogers [CAN. ENT., VII., 199] describes the eggs of Luna as "dark brown or chocolate colour, flattened at the sides, smooth, and about .05 of an inch in length; the sides were of a lighter shade." Saunders [Sixth Ann. Report, 41] says of Polyphemus: "The egg is about one-tenth of an inch in diameter, convex above and below, with the convex portions whitish and the nearly cylindrical sides brown." Minot [CAN. ENT., II., 27] also describes Luna eggs as very dark sepia, although some were almost entirely white. My eggs appeared to me to answer better to the description of those of Luna, and as the difference in method of attachment to food-plant was not given, I came to the conclusion that they were those of Luna, as the moth is usually abundant in the grove of hickories where the eggs were obtained.

W. HAGUE HARRINGTON.

A CANADIAN TRIGONALYS.

BY W. H. HARRINGTON, F. R. S. C., OTTAWA.

Trigonalys Canadensis, n. sp.

Male.—Length, 10.5 mm. Black with yellowish markings. Head transverse, as wide as thorax, about twice as wide as long when viewed from above; face above the antennæ, and vertex, polished, impunctate, without apparent sutures and with sparse blackish pubescence; the cheeks and under surface with pubescence more dense; clypeus polished; palpi slender; antennæ as long as head and thorax, rather stout, eighteen-jointed, segments subequal; eyes small but prominent; ocelli small, in a triangle on a line with the posterior margins of the eyes. Thorax rugose with coarse, irregular punctures, those of the pleura and pectus smaller and more numerous; posterior angles of prothorax yellow; legs rather slender, coxa and femora black, remainder yellow, the tips of tibiæ and tarsi somewhat dusky; wings subhyaline, with dark stain covering marginal cell and extending slightly beyond each end of it, stigma and costal nervures black, remaining nervures reddish, second and third submarginal cells subequal; scutellum abruptly rounded posteriorly, post-scutellum yellow, prominent, subpyramidal, notched at apex, in suture on each side several deep shining foveæ; metathorax very short and rounded at sides, without prominent angles, a small yellow spot on each side. Abdomen polished, impunctate, apparently with six segments; second segment as long as all the following and with a yellow central band, or elongated spot on each side; a yellowish spot at lateral base of segments 3 and 4, very faint on the latter; venter slightly pubescent, with double row of yellow spots on segments 1 to 5, largest on 2nd.

This is the first record of the occurrence of any member of the family Trigonalidæ in Canada, and I am indebted for the privilege of describing the specimen to Mr. Fletcher, who received it in Sept., 1893, from Mr. Wilkinson, of Victoria, B. C. It was taken from the cell of a wasp (probably *Vespa occidentalis*) which had built on his verandah, and he had observed that the wasps were rapidly decreasing in numbers, apparently from the presence of this parasite, and of a smaller species of hymenopteron, of which, unfortunately, no specimens appear to have been preserved.

ITHYCERUS NOVEBORACENSIS, FORST.

In former years I had found this beetle, the largest and most conspicuous weevil of our fauna, to occur only upon beeches, as noted in my sketch of the Rhyncophora, in Eleventh Annual Report. Such, also, was Mr. Chittenden's record [Ent. Am., Vol. VI., 168]. Its infestation of the twigs of oak had been recorded by Riley, who described the larva. Its occurrence upon hickory is noted by Mr. Beutenmuller [CAN. ENT., XXII., 201], and it is known as injurious to apple and other fruit trees. On June 9th, 1895, I observed a pair in *coitu* upon the trunk of a hickory (*Carya amara*), where there were no beech trees near by, and on carefully examining other hickories in the immediate vicinity I found five more pairs. Two or three days later I examined the same trees and could not detect a single beetle, nor did I find any on subsequent examinations. This shows that missing the exact date for such an insect might lead to its escaping observation entirely, as those trees had been examined in former years.

W. HAGUE HARRINGTON.

A CORRECTION.

For the new genus of Megalopygidæ, *Brachycodion*, described in the last volume of CAN. ENT., read *Aidos*, Hübner. The genus is not in Kirby's Catalogue, and I thus came to overlook it. The following is the synonymy:—

Genus *AIDOS*, Hübner.

1818. Hübner, Verz. bek. Schmett., p. 191, No. 1962, *Brachycodion*, Dyar.

1895. Dyar, CAN. ENT., XXVII., 244.

Type *A. amanda*, Stoll.

I must apologize for this synonym by hastening to correct it.

HARRISON G. DYAR.

Through the kind consideration of Mr. A. R. Grote, the Society has been put in possession of his paper on the Apatelidæ, noticed by Dr. H. G. Dyar, in CAN. ENT., Vol. XXVIII., p. 86; also, the original photographs of the plates, beautifully executed, and greatly admired by all who see them. The form and ornamentation are displayed with remarkable life-like distinctness, even to the tubercles and rounded bodies of the larvæ, which are somewhat lost on the plates, but well defined in the photos, testifying to the great advance that has been made in this method of illustrating entomology since Mr. Grote first adopted it twenty years ago.

J. ALSTON MOFFAT.

NOTES ON NEW MEXICO AND ARIZONA HYMENOPTERA.

BY C. H. TYLER TOWNSEND, LAS CRUCES, NEW MEXICO.

With the exception of some undetermined gallflies and parasites, the following list of 86 species contains all the Hymenoptera collected (and bred) by the author, in the South-west, of which it has proved possible to get the names, except four mentioned in CAN. ENT., 1892, p. 200. The gallflies and parasites above referred to will be recorded in some papers to be published in the future. The cottonwood, *Blennocampa*, mentioned in CAN. ENT., 1893, p. 304, and in ZOE, iii., pp. 234-236, should also be included in the above exception.

As the list is not large, the species are arranged alphabetically. The fact that I have not been able to refer to Cresson's catalogue explains this, as it does the absence in most cases of the authorities for the species.

In the four cases where the query and asterisk occur, two species got mixed under one number in sending for identification to *Ent. News*, so that it is uncertain to which the locality and notes belong.

Agapostemon melliventris, Cr.—La Vega de San José, Valencia Co., N. Mex., August 4. One. A small, elongate species, with head and thorax entirely vivid Paris-green colour. Abdomen, legs, and antennæ yellow, the hind borders of segments brown. Det., Fox.

Allantus uncinatus, Nort.—Hart Little Spring, Arizona, July 14. Seven specimens. Det., Fox.

Andrena, sp.—Las Cruces, N. Mex. One ♂. A moderately small, elongate, entirely black species. Wings slightly fuscous. Det., Fox.

Andrena, sp.—Las Cruces, N. Mex. One ♂. Clypeus white. A small, elongate species. Black; thorax and head whitish pubescent. Wings slightly smoky. Det., Fox.

Anthidium, sp.—Las Cruces, N. Mex., May 17. One ♂. A moderately small species with clear wings. Thorax with yellow border, except in front, and two delicate yellow vittæ. Abdomen black, with yellow hind border to each segment. Det., Fox.

Anthidium, sp. near *mormonum*.—Las Cruces, N. Mex. One. A small form, with wings clear. Abdomen black, with irregular yellow hind borders to segments, interrupted in middle on six segments. Det., Fox.

Anthidium interruptum, Say.—Chaves, N. Mex., August 6. Three. Las Cruces, N. Mex. One. Det., Fox.

Anthophora, sp.—Hart Little Spring, Arizona, July 14. One specimen. A grayish pilose bee, larger than *Megachile relativa* ♀, and with the abdominal bands of pile gray. Det., Fox.

Anthophora, sp., probably n. sp.—Chaves, Valencia County (near Los Lunas), N. Mex., August 6. One ♂. A species of moderate size, fulvous pilose, including first abdominal segment, rest of abdomen black with white or yellow hind borders to segments. Wings clear. Det., Fox.

Anthophora, n. sp.—La Vega de San José, N. Mex., August 4. One ♂. Wholly yellowish, whitish pilose, with clear wings. A rather large species. Det., Fox. (?) *

Anthophora maculifrons?—Las Cruces, N. Mex. One ♂. Small species, grayish cinereous pilose all over, only front border of abdominal segments 1 to 3 showing black. Pile on abdomen very short. Wings clear. Det., Fox.

Anthophora montana, Cr.—La Vega de S. José, N. Mex., August 4. Two specimens. Det., Fox.

Anthophora occidentalis, Cr., ♂.—La Vega de S. José, N. Mex., Aug. 4. One ♂. Wholly yellowish, whitish pilose, with clear wings. A rather large species. Det., Fox. (?) *

Anthophora Walshii, Cr., ♂.—La Vega de San José, N. Mex., Aug. 4. One. Clypeus white. Six abdominal segments with white hind margins. Det., Fox.

Braconid.—Grand Canyon, Arizona; Hance trail, July 11th. One specimen. A bright red species, with wings fuscous or black. Det., Fox.

Calliopsis, sp.—Las Cruces, N. Mex. Two. Det., Fox.

Cecoris (sic *Cerceris*?) *venator*, Cr.—Chaves (near Los Lunas), N. Mex., August 6. One. Very like *Eucerceris*, sp., but basal abdominal segment smaller and black. Det., Riley.

Centris, sp. ♀ (♀ of *lanosa*?).—Las Cruces, N. Mex. One. Det., Fox.

Cerceris bicornuta, Say.—La Vega de San José, N. Mex., August 4. Two. Det., Riley.

Chalybion ceruleum, L.—La Vega de San José, N. Mex., August 4. One. A small bluish-black wasp, a common species in the Eastern U.S. Det., Riley.

Chelonus sericeus, Say.—Continental Divide, Tenaja, N. Mex., Aug. 2. One. A blackish saw-fly (?). Det., Riley.

Chlorion occultus.—La Vega de San José, N. Mex., Aug. 4. One specimen. El Rito, N. Mex., Aug. 5. One specimen. Det., Fox.

Crabro, sp.—Hart Little Spring, Arizona, July 14. One. A black, shining hornet, with abdomen banded with yellow, but no yellow on scutellum. Det., Fox.

Crabro, sp., near *Packardi*.—Hart Little Spring, Arizona, July 14. One. A black hornet, of narrowed form. Abdomen banded with yellow, legs yellow. Det., Fox.

Crabro delectus, Cr., ♂.—Continental Divide, Tenaja, N. Mex., Aug. 2. One. A small black and deep yellow hornet. It was infested with two dozen small rufous mites on dorsum of base of abdomen. Det., Riley.

Crabro minimus, Pk.—Las Cruces, N. Mex. Name com. by Prof. Cockerell. Det., Fox.

Cryptus, sp. aff. *americanus*.—Hart Little Spring, Arizona, July 14. One specimen. A good-sized black ichneumonid with red abdomen. Det., Fox. (?) *

Cryptus callipterus, Say, ♂ ♀.—Las Cruces, N. Mex. An ichneumonid. Two females and two males. One of the males is considerably smaller and more slender, and generally darker. Det., Riley.

Cryptus proximus, Cr.—Hart Little Spring, Arizona, July 4 and 14. Two specimens. Det., Fox.

[TO BE CONTINUED.]

BOOK NOTICES.

“Handbuch der paläarktischen Gross-Schmetterlinge für Forscher und Sammler,” by Dr. M. Standfuss, Jena, 1896 (Verlag von Gustav Fisher).

This is a second edition of the “Handbuch für Sammler der europäischen Gross-Schmetterlinge” rearranged and enlarged by the addition of certain studies in the theory of descent; 392 pages, and eight coloured lithographic plates.

The author gives an extensive account of the methods of collecting, of breeding larvæ, pairing of imagoes, both of the same and of different species, etc., interspersed with interesting philosophical remarks. As the preface says, “this book unites in itself two objects: lepidopterological practice and scientific-zoological speculation.” The special case of hybridization recounted in detail, on pages 66 to 107, represents a very neat piece of work. The author shows, by considerations of the

egg, larva, pupa, and imago, that the three Saturnias, *spini*, *pavonia* and *pyri*, differ in degree of specialization; that they are phylogenetically of different ages, *spini* being the oldest, or least specialized, and *pyri* the youngest form. The hybrid larvæ between the first two and last two are figured adjacent to the normal forms, and the greater resemblance of the hybrid to the more generalized form in each case is striking, thus neatly confirming the conclusions already reached, and all on the lines laid down by Weismann.

Our author also gives an account of experiments on the effects of different temperatures on hibernating larvæ and pupæ, with figures of some of the forms of imago produced. There is an account of variation, seasonal dimorphism, local forms, etc., discussed from the most recent scientific standpoint. The book contains much of interest which it is unfortunate that we are not able to enjoy more easily in an English edition.

HARRISON G. DYAR.

BRITISH MOTHS, by J. W. Tutt. London: George Routledge & Sons.
Pp. 365.

The young collector in the British Isles will no doubt welcome this manual, which will not only help him to name any specimen that he may collect, but give him also much information regarding the habits of the moth in its preparatory as well as perfect stages. It is written in the author's well-known pleasant and readable style, and is not merely a dry handbook. There are twelve coloured plates and over sixty wood-cuts, illustrating the majority of the families. There are also a number of tables, giving the times of year when the species may be looked for in the egg, larval, pupal, and perfect states; the food-plant of the larva; the location of the pupa; and notes on the variety or abundance of the moth. It would have added much, we think, to the handiness of the book if it had contained comparative tables of genera and species as well.

RANDOM RECOLLECTIONS OF WOODLAND, FEN, AND HILL, by J. W. Tutt.,
F. E. S. London: George Gill & Sons. Pp. 256. [2s. 6d.]

We are glad to see that a second edition of this delightful little book on outdoor natural history has been called for. In this new issue the matter has been, to some extent, rearranged and revised, and its attractiveness has been much enhanced by a pretty cover and over a hundred excellent illustrations. Though it deals with "Old Country" scenes, and the insects, birds, and plants that frequent them, it can be read with great interest by any lover of nature in any part of the world.

REPORT OF OBSERVATIONS OF INJURIOUS INSECTS AND COMMON FARM PESTS DURING THE YEAR 1895, WITH METHODS OF PREVENTION AND REMEDY. Nineteenth Report, by Eleanor A. Ormerod, F. R. Met. Soc., etc.

This splendid report fully sustains the high standard of excellence which has characterized Miss Ormerod's previous publications. The preface shows that the unusual and prolonged low temperature of the winter of 1894-95 had apparently but little affected the insects which it might be supposed to destroy.

The following pests are treated of in separate chapters: Apple, *Smerinthus ocellatus*; bean, *Bruchus rufimanus* and *B. fabæ*; cabbage, *Ceutorhynchus sulcicollis*; corn and grass, *Charæas graminis*, *Cetonia aurata*, *Phyllopertha horticola*, *Melolontha vulgaris*, *Rhizotrogus solstitialis*, *Tipula maculosa* and *Oscinis frit*; gooseberry, *Bryobia prætiosa*, *B. ribis* and *Nematus ribesii*; mangolds, *Aphis rumicis*, *Silpha opaca* and *Atomaria linearis*; orchard caterpillars, *Cheimatobia brumata*; pine, *Astynomus adilis* and *Retinia buoliana*; plum, *Scolytus rugulosus*; strawberry, *Harpalus ruficornis*, *Pterostichus madidus* and *F. vulgaris*; turnip, *Helophorus rugosus*.

The ravages of the bean weevil appear to have been serious, and those of the ground beetles, upon strawberry, have been more extensive than in previous years. Ninety-three pages are occupied with the discussion of the above mentioned insects, while fifty are allotted to "Flies injurious to horses, cattle," etc. These chapters are exceedingly interesting, and several species of Hippoboscidae, Tabanidae, and Cæstridae, which are very annoying and injurious to domestic animals, are fully and clearly discussed. In connection with the account of the attacks of the Forest Fly, *Hippobosca equina*, are given two magnificent plates showing upper and side views of the foot of this fly, the tarsi of which are so modified as to enable it to secure a most firm grip on the hairs of the animal upon which it alights. The report concludes with a chapter on Deer and Dog Ticks, very troublesome mites belonging to the Ixodidae. W. H. H.



JOHN M. DENTON.

The Canadian Entomologist.

VOL. XXVIII.

LONDON, MAY, 1896.

No. 5.

JOHN M. DENTON.

It is with profound regret that we record the death of our old friend and highly-esteemed colleague, Mr. John M. Denton, of London, Ontario, who was one of the early members of the Entomological Society and always took a very lively interest in its welfare. For some months he had been in poor health, owing to an affection of the liver, but was able to attend his place of business from time to time, and to take part in the proceedings of our annual meeting in November last, when many of us saw him for the last time. In January his illness assumed a more acute form and confined him to the house. On Tuesday, March 24th, he was seized with paralysis and before midnight passed peacefully away.

Mr. Denton was born in Northampton, England, on the 19th of September, 1829. His father was a farmer by occupation, and he was consequently brought up in the country amidst rural scenes and learnt there to love and observe the beauties of nature. At the age of fourteen he was apprenticed to a woollen draper and tailor, and spent seven years in thoroughly learning the trade and becoming proficient in all its details. For a few years he was engaged in business on his own account, and in 1855 married Miss Ann Walker, of Somersetshire, England, who survives him. He then emigrated to Canada and settled in London, and at once resumed his occupation as a tailor, having but little to begin upon except a hopeful heart and a thoroughly practical English training. By patient industry, unfailing courtesy, and unswerving integrity, he built up by degrees a most successful business as a merchant tailor, and won the respect and esteem of the whole community.

Living on a farm in his boyhood and apprenticed at so early an age, he had but little opportunity of acquiring a literary education, but by constant application and careful reading he overcame these disadvantages

and attained a more than ordinary knowledge of the subjects that interested him. Foremost among these was Entomology, which he studied especially in its economic aspects as affecting live stock, fruit trees, garden and field crops. He became an authority on these topics, and was frequently called upon to address meetings of farmers and fruit growers and give them the benefit of his knowledge and experience. His love of the farm continued throughout his life, and he devoted much of the time that he could spare from business to the cultivation of a fruit farm a few miles from London. He was no mean authority upon horses and cattle and had a considerable knowledge of their diseases and most satisfactory treatment. He was also an adept with the microscope and took great delight in searching into the hidden beauties of nature.

When the London branch of the Entomological Society was formed in July, 1864, he was one of the original members, and took a most active interest in it and the parent Society to the close of his life. He was elected Vice-President of the London branch in 1872, and President in 1878 and several years following. In 1871 he became a member of the Council of the parent Society and continued to hold office for five and twenty years; in 1892 he was elected Vice-President, but he would never allow himself to be nominated for the Presidency, though urged to do so more than once. He was also an active member of the Ontario Fruit Growers' Association and gave much assistance to its work.

He was a man of deep religious feelings and of earnest but unobtrusive piety. Though a leader of the Plymouth Brethren, he never intruded his views upon those who differed from him. The writer knew him well for a great number of years, and during his visits to London often enjoyed his hospitality, but never did he hear a word fall from his lips that could wound in the slightest degree the susceptibilities of those who did not accept the theological opinions that were so dear to him. He was a good, honest, sterling man whom all respected and whom his friends loved; kind, charitable, and generous; courteous in manner, most hospitable in his home, above reproach in business; a man who is a distinct loss to the city in which he lived, and whose death creates a blank in the hearts of his friends which can never in this life be filled. To his childless, sorrowing widow we tender our deepest, sincerest sympathy.

CAPTAIN J. GAMBLE GEDDES.

It is our painful duty to record the loss of another active member of the Entomological Society of Ontario. At two o'clock on Good Friday morning, April the 3rd, Captain J. Gamble Geddes died after a few days' illness, brought on by a severe cold. He was born in Montreal in 1850, and educated there. When a young man he entered the service of the Molsons Bank and was for some time attached to the office in London. He at once joined the Society and became an enthusiastic member. In 1874 he was elected Secretary-Treasurer of the London branch; in 1875, Vice-President; in 1876, President. He left London on his appointment as manager of the agency of Molsons Bank at Millbrook. Here, living in the country, he devoted most of his leisure time to the collection and study of insects, applying himself especially to the Lepidoptera. In 1880 he left the Bank and was appointed Aide-de-Camp and Private Secretary to the Hon. John Beverley Robinson, during his term of office as Lieutenant-Governor of Ontario. Being fond of society, of handsome presence and devoted to music, he became a great favourite among the social circles of Toronto, among whom much of his time was accordingly spent. He did not, however, abandon the pursuit of Entomology, but succeeded, by correspondence and exchange, in addition to the captures of his own net, in forming a large and valuable collection of butterflies from all parts of the world. This he sold to the Dominion Government, and it now forms the nucleus of the collection in the Geological Museum at Ottawa. He made expeditions in 1883 and 1884, to Manitoba and the Northwest Territories, as far as the Rocky Mountains, in quest of butterflies, and added much to the knowledge of their geographical distribution and habits. On several occasions he visited England, and spent some time in Germany and also in Bermuda. Wherever he went he made the acquaintance of the leading Entomologists and added to his stock of knowledge.

His first contribution to this magazine was in 1874, when he wrote No. 14 of a series of articles on "Some Common Insects"—"The

Common Cockchafer," C. E., Vol. VI., p. 67. His subsequent papers were the following :—

"List of Diurnal Lepidoptera collected in the Northwest Territories and the Rocky Mountains in 1883," C. E., XV., 221; XVI., 56, 224; XVII., 120; one hundred and twenty-six species were enumerated.

"Euptoieta Claudia," C. E., XVII., 60 (1885).

"Notes on Three Small Collections of Diurnal Lepidoptera, made in 1886" [These were made in Newfoundland, the Kamanistiquia River, Lake Superior, and Hudson Straits], C. E., XVIII., 204.

"Some Notes on the Genera *Colias* and *Argynnis* whilst alive in the Imago State," C. E., XIX., 166 and 230 (1887).

"Notes for Collectors visiting the Prairies and Rocky Mountains," C. E., XXI., 57 (1889).

"*Colias Chione*," C. E., XXI., 59.

He also contributed the following articles to the Annual Reports of the Society :—

"Some Remarkable Captures in Ontario," 18th Report, 1877, page 21.

"On Some of the Collections in England and the German Empire," 22nd Report, 1891, p. 31.

"Insects Collected in Bermuda during the Winter of 1894," 25th Report, 1894, p. 25.

In addition to his love for Entomology, he took a great interest in Philatelics, and formed a large and valuable collection of postage stamps. He was an accomplished musician, and usually sang in the choir of the church that he attended; he was also a member of the Philharmonic Society of Toronto. He belonged to the Masonic Order, in politics was a strong Conservative, and in religion a member of the Church of England. His wife, who was a daughter of the late Edward C. Jones, of Toronto, died a little more than a year ago. The untimely death of Capt. Geddes was no doubt hastened by her loss. They have left two little orphan girls, aged three and five years respectively.

The writer, who knew him intimately from his boyhood, deeply deploras his loss, and his grief is shared in by a very large circle of relatives and friends.

TWO NEW SPECIES OF PAPIRIUS.

BY JUSTUS WATSON FOLSOM, CAMBRIDGE, MASS.

Papirius vittatus, n. sp.

Younger specimens dark purple above with pearly markings, lavender or lilac beneath; older ones maroon to almost black above, sides mottled with several shades of purple and brown. Head free, purple, with a broad, white transverse band across the front; oral region whitish; vertex with a distinct, white, sagittate mark from antennæ to prothorax; a black ocellus-like speck on the middle of the vertex; a few short bristles upon vertex and front; eyes dark, close behind antennæ upon a black patch narrowly surrounded by purple. Antennæ longer than the body, except in largest individuals, segments variable in relative length, but approximately in the ratio of 1:6:7:1.5 or 1:7:9:2; basal segments stout, as long as broad, brownish, with short, white bristles; second brownish at base, purple at middle, pearly apically, hairy distally; third purple, hairy, with obscure, whorled subsegments on apical half, broadening towards apex, penultimate subsegment swollen on one side; terminal segment purple, lanceolate in outline with five to seven distinct, whorled subsegments. Body ovate dorsally with a re-entering angle. Dorsum dark purple to blackish, with a pattern in pearly white, essentially as follows: On anterior half of dorsum a median longitudinal purple streak between two pearly streaks with dentate margins; behind these a squarish purple spot bounded by pearly and bisected by a short, median longitudinal, pearly streak; on either side, two short, irregular, pearly lobes extending obliquely forwards: next behind on the median line are one to three roundish purple spots broadly surrounded by pearly white; on posterior of abdomen a long, oblique pearly bar directed forwards from either side of the median line. Largest abdominal segment with a small, pale tubercle on either side of the middle. Dorsum naked anteriorly, with short white bristles posteriorly. Anal tubercle with bristles four times as long, and with a median longitudinal purple bar. Sides purple to blackish, with conspicuous hazel, chestnut and cinnamon mottlings. Thorax with a broad, lateral, longitudinal pearly band, sometimes replaced by one to four bright white spots. Sides of abdomen with two to five large, conspicuous, pure white spots, widely separated. Ventral surface lilac or lavender. Ventral filaments extensible to the length of the antennæ. Legs long, purple and yellow; tibia with broad alternate bands of dark violet and wax-yellow, white bristly. Claws

white; superior claw long, tapering, rather straight, six toothed; inner edge with two prominent teeth at about equal intervals; two more on both sides near the outer edge, dividing it into thirds; inferior claw half as long as the other, straight, tapering, bearing subapically a slender bristle longer than the claw, also a tooth upon a swelling on the inner edge near the base. Furcula almost reaching the head; manubrium stout, purple; dentes twice as long, slender, pale lilac, each with long white bristles on either side, and a single, extra long ventral, subapical bristle; mucrones white, less than one-third the dentes, narrowly elliptical, ventral concavity shallow, with distinctly serrate edges, apex clearly emarginate, having a median, rounded quadrate notch between two rounded teeth.

Maximum length, 3.3 mm. Described from over fifty specimens.

This species was found abundantly in February and March of this year, in a greenhouse at Cambridge, Mass., upon wet, decaying wood, and upon the outside of alga-coated flowerpots, especially in warm, moist and shaded situations.

P. vittatus is closely allied to *P. marmoratus*, Pack. I have examined the types of the latter species which have shrivelled and lost colour, yet show distinct, structural differences from *P. vittatus*, especially in the claws and mucrones. *P. marmoratus* has a longer, oblong mucro, not emarginate, but terminating in a distinct, rounded lobe; the distal spines of the dentes are clearly barbellate; claws shorter and stouter; the superior claw has four teeth much more obscure than the six of *vittatus*: an evident tooth on the middle of the inside, a second, obscure, midway towards the apex, and a pair of small lateral teeth near the outer edge, one-third from the apex; the inferior claw has a short, apical bristle, and is less dilated basally than in *P. vittatus*.

This species is easily recognized by the broad white head band, the sagittate mark, the three median dorsal streaks, and the brilliant white spots on the sides of the abdomen.

Papirius opalinus, n. sp.

General colour orange-rufous or ferruginous. Head, first two antennal segments, anal tubercle, and legs pale orange-ochraceous. Head with a few short bristles on front; vertex almost naked, swollen dorsally; eye spots black, often quadrate. Antennæ shorter than the body, from three-quarters to one-half as long, according to age; basal

segment twice as long as broad, naked; second three or four times as long, knotty, hairy towards apex; third purple, four or five times the basal, knotted, hairy except basally, obliquely dilated but squarely articulated at apex; terminal segment purple, half again the basal, lanceolate, moderately long, white, hairy. Body regular, elongate-oval in dorsal outline; anterior dorsum naked, translucent orange-ochraceous with a broad and long median shading of green due to chlorophyll in the stomach (lateral, convulsive movements of which are easily observable in living specimens); posterior dorsum and sides orange-rufous to dark ferruginous, often with a tinge of maroon, the general colour being due to the combined effect of minute orange-ochraceous and ferruginous mottlings; posterior dorsum with short white bristles upon minute, round, orange-ochraceous spots; anal tubercle hardly visible from above, bristly. Ventral surface pale yellow, with three pairs of smooth, buff-yellow tubercles: a small, rounded tubercle on either side the manubrium; a large, oval, oblique one either side the middle; a narrow, oblique pair anterior to these; ventral tube pale orange-ochraceous, transparent, buff-yellow inside at base; tube plus protruded filaments one-fourth longer than the antennæ. Legs slender; femur with sparse, short bristles; tibia paler distally, stout spiny at moderate intervals; claws white, very stout; superior claw of almost uniform width, little curved towards the mucronate apex, six toothed: inner edge with a tooth at the middle, and another midway between it and the apex; two pairs of lateral teeth, similarly placed near the outer edge; inferior claw two-thirds as long as the other, long triangular, tipped with a short bristle from a stout, straight midrib; inner edge sinuate or straight, with a short bristle one-third from base. Furcula short, reaching to ventral tube; manubrium extending beyond anal tubercle, sparsely hairy; dentes twice as long, stout, pale orange-rufous, with short, lateral bristles, and several longer, ventral bristles at regular intervals; mucrones white, one-fourth dentes in length, oblong, finely serrate beneath, apex rounded.

Maximum length, 1.6 mm. Described from over fifty specimens.

This species occurred abundantly with *P. vittatus* at the same time and place, feeding upon algæ on the outside of flowerpots, and, curiously, having the exact colour of the latter.

Types of the above species have been given to the Museum of Comparative Zoology at Cambridge, Mass.

LEPYRUS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PENN.

The species of Lepyrus in North America have not heretofore been well understood. The genus has recently been treated monographically by an American writer, several forms being described for the first time : one of these has since been discovered to be identical with the European *capucinus*, Schall, and *geminatus*, Say, to be *palustris*, Scop. To make these species better known is the object of the present paper, and the following synonymy and bibliography are presented :—

LEPYRUS PALUSTRIS, Scop., 1763, Entomol. Carniol, 33; *colon*, Linn., 1771, Mant., p. 531; Kirby, Faun. Boreal, IV., 197; Leconte, Mon. Rhyn., p. 127; *geminatus*, Say, Lec. ed., I., 273; *geminatus*, Casey, Ann. N. Y. Acad. Sci., VIII., 825.

In the work referred to, *colon* = PALUSTRIS, which to that time had been considered common to the two hemispheres, was suppressed, and the American form united with *geminatus*, the reasons being an alleged more elongate form, much larger and more transverse prothorax carinate along the middle, a carinate beak, and much sparser vestiture. The reasons assigned conclusively prove that the writer was not well acquainted with the European form as a whole, nor even with the American. Such differences do exist, but they are merely individual and apply equally well to the extremes of the individuals of either continent. Here it may be remarked that the European examples usually seen in collections rarely fairly represent the species, being mostly the largest and more conspicuous, which are the most uniform and least characteristic : that most frequently seen here being the form with a long cylindrical sub- or non-carinate beak. That the individuals of this species are very variable in Europe is evident from the number of named varieties in the catalogue, and that the same holds good here may be seen in any collection containing examples from all parts of the Continent where it inhabits. Before me are fifty examples from several localities in Europe (Italy, Austria, Switzerland, France, Portugal), exhibiting great diversity in form, size, sculpture and vestiture, but finding counterparts in the American forms before me from Massachusetts, New York, Canada, Michigan, Indiana, Wisconsin, Missouri, Kansas, Colorado (Greely, Garland), Nebraska, Manitoba (Winnipeg). The only constant characters I have yet discovered among these diversified forms are in the mesosternum, which is flat between the coxæ, a little narrower and more triangular in the male than in the female; and in the tibial situation of the

femora, with a small mucro internally (sometimes not very evident). Where these characters are found, however diverse the forms, specific unity is indicated.

Before drawing comparisons, it will give better results to note the differences among the foreign forms, and for contrast, that approximating most closely the American as described by Kirby is selected for description.

Alate, surface black, clothed with gray, hair-like scales, an oblique stripe on each side of the thorax, a spot on the fourth interval of the elytra in front of middle, and a row of spots on each side of the abdomen of longer, denser white scales; the femora also annulate with white; the abdominal spots are more frequently yellow, and often the stripes on the thorax. Head densely squamulose, finely and closely punctate, a linear fovea between the eyes; antennae with the first joint of the funicle short and thick, second longer and attenuate to base, scape attaining the eye or not, according to the length of the rostrum; beak a little longer than the thorax, cylindrical, a little dilated in front of the insertion of the antennae, densely squamulose, finely and closely punctate, carina fine, attaining the frontal fovea or not. Thorax coniform, narrowed, more or less sinuously, from base to apex, where it is slightly constricted and about two-thirds as wide as at base, one-fourth wider than long; disk irregular, often flattened and uneven, densely punctato-rugose, varying from fine to coarse; sides coarsely tuberculo-rugose, median carina ending in the basal depression, sometimes abbreviated, sometimes obsolescent. Elytra three-fourths wider than thorax, about one-half longer than wide, apices mostly separately acuminate and porrect, sometimes conjointly rounded with a slight notch, serial punctures variable in size and closeness, intervals mostly even, sometimes the third, fifth and seventh wider and elevated. Femora mostly armed with a small spine; mesosternum flat, more or less triangular.

The following individual variations may be noted:—

Rostrum.—Varies from about as long as the thorax to one-fifth longer, sometimes strongly cylindrical in the longer beaked, in which the carina is weak and frequently apical; more quadrate in the shorter beaked, with the carina stronger, often attaining the fovea.

Antennae.—In examples with short rostrum the scape reaches the eye, but not in those with it elongated.

Thorax.—One-fourth to one-fifth wider than long, sides often a little dilated at apical third; other variations are mentioned in the description.

Elytra.—The serial punctures may be large and irregularly spaced or smaller and closer; examples of the same length vary in the median width of the elytra one-sixth of the width or more; the humeral angles are usually rounded to thorax, but not infrequently full and obtusely angulate. Other variations are noted in the description.

Vestiture.—In the form described it is long, hair-like, and moderately evenly distributed over the surface; in other forms it is so short as to but imperfectly conceal the surface; in others both lengths occur; the colour varies from uniformly cinereous to uniformly yellowish-brown, the

intermediates being variously tessellated or spotted with white, brown, yellow, and gray scales irregularly intermixed ; the thoracic stripes, the elytral and abdominal spots, and the spots frequently seen on the apical protuberances vary from white to yellow.

Femora.—The internal angle of the sinuation for the tibia is nearly always armed with a minute spine in all the femora, but to be seen in some examples requires close observation, and seems occasionally to be obsolete.

Contrasted with the European *palustris* as a whole the American completely harmonizes, while at the same time it is just as variable and might likewise be separated into varieties ; there might be a var. *Kirbyanus*, a var. *geminatus*, etc.

The rostrum, while mostly shorter, with the scape attaining the eye, is occasionally as long as in any of the European examples ; it is usually stouter, more quadrate and with a stronger carina, but these differences are not constant. The thorax in general offers few points, the most noticeable being that the median carina is usually stronger and seldom absent. The elytra while variable individually in regard to the serial punctures, form and punctuation of the elytral intervals, do not differ in these respects from what is seen in the European. The form vestiture and coloration are in no way different. The mesosternum and femoral armature are identical. These two characters with the forms of the first two joints of the funicle are very constant in every variety of both countries and the only ones yet discovered which can claim absolute specific value.

This species varies in length from .26 to .45 inch. I have taken it in Canada on the willow, and it is said to occur likewise on the aspen (*Populus*). It seems to be the species most commonly met with ; besides the places heretofore mentioned, it is reported from Louisiana and Illinois.

The question has been asked : With what species did Dr. Leconte compare *geminatus*, since *colon* has the tips of the elytra acuminate [Mon. Rync.]? I can only say that it may have been an example of *colon* with the tips conjointly rounded, which sometimes occurs ; or it may have been *capucinus*, in which they are habitually rounded and which is labelled *colon* in some collections. Say's *geminatus* had a white spot on the elytra, Dr. Leconte's a yellow one. In some collections all examples with the spot white are labelled *colon* ; all with it yellow

geminatus; in collections containing *capucinus*, which is not very common, that species is labelled *colon*; and all others *geminatus*, without regard to the colour of the elytral spot, and again that is labelled *geminatus* and all others *colon*.

L. CAPUCINUS, Schall., *alternans*, Casey.—Length, .36-.45 inch. Habitat—Michigan, New Hampshire, Maine.

Black, apterous, form robust, vestiture variable. Rostrum stout, longer than the thorax, sulcate on each side of the carina which attains the frontal fovea or not, closely, unevenly, partly confluent punctured; scape of the antennæ attaining the eye or not, the first and second joints subequal in some examples, the second much longer in others, probably sexual differences. Thorax transverse, wider than long, sides parallel to apical third, then rapidly rounding to apical constriction, apex one-fourth narrower than base; sub-convex, surface even, a slight depression in front of scutellum, closely covered with granuloid tuberculations small on the disk, larger and rugous on the sides; median carina fine, mostly attaining the base. Elytra oval, in general one-half longer than wide, two-thirds to three-fourths wider than thorax; striate, striæ obscured by the vestiture, but when denuded, deep and narrow, with a row of punctures in the bottom; intervals either regular and evenly spaced or irregular with the first and third wider, the others perceptibly narrower and slightly furrowed along the middle; the granuloid tubercles vary from excessively fine to moderately coarse; apices conjointly rounded. The anterior femora in the male have the tibial sinuation rectangularly laminate on the upper side, and usually the middle and posterior; mesosternum elevated between the coxæ. The vestiture is variable, but mostly of gray and whitish elongate scales evenly intermixed, sparse, not concealing the black surface, the usual median spot on the elytra absent, but a white one on each apical protuberance, the abdominal spots wanting or only traceable in a few denser white hairs. In an example from New Hampshire the vestiture is mottled and denser, the abdominal and median elytral spots present.

In the European examples seen (all males) there are no abdominal nor median elytral spots, and the vestiture is that first described. The fuller description of the present species, with more ample material than that of Mr. Casey, has reduced the alleged differences between this and *Canadensis*, Casey, to this: Striæ not distinctly punctured, *Canadensis*; striæ distinctly punctured, *capucinus* (*alternans*). This seems to be too small a difference, all other things being equal, on which to base a species, especially in a genus where the individual characters are so instable.

LEPYRUS PERFORATUS, Casey.—While this species in form is similar to *palustris*, and with the same form of ornamentation, yet it is structurally different; the femoral sinuation is gradually rounded, not spinose as in *palustris*, nor angulate as in *capucinus*; the mesosternum is sub-elevated, not flat as in the former, nor so prominent as in the latter. The general vestiture is very short and sparse, not concealing the tubercular rugosities and variously tessellate with minute, denser, pale scales; the elytra and under side are covered with distant, small, polished black

tuberculoïd granules, much larger on the thorax ; the intervals are slightly alternately narrower, sometimes on the same plane, sometimes the narrower deeply depressed, producing a costate appearance ; the serial punctures are large and unevenly spaced ; the apices are conjointly rounded with a slight notch. This species is fully as large as *gemellus*. The examples seen are from Vancouver Island and the high mountains of British Columbia.

Mr. Casey has described some forms which have not been seen.

L. OREGONUS, the describer states, differs from *palustris* (*geminatus*) in the more elongate form, much smaller and less transverse prothorax, longer and almost non-carinate beak, coarser serial punctures, and more prominent sutural angles of the elytra. Habitat—Oregon.

L. PINGUIS, Casey, is said to differ from *geminatus* by its more obese form, stouter beak and coarser punctuation, more exposed humeri, more declivous elytra and denser vestiture. Habitat—Colorado (Rocky Mountains).

L. ERRANS, Casey, is described from a unique taken in the mountains of New Mexico, near Abiquire, in which the elytral intervals are separated rather by striæ than by series of punctures, alternately narrower and depressed, the narrower more finely sculptured and clothed with denser brown squamules ; the elytra tessellated with patches of denser pale scales, and the usual median spot not distinguishable. The beak is longer than the thorax, with a broad and feeble carina.

L. CANADENSIS, Casey.—As stated under *capucinus*, this species should probably go into synonymy, but the form has not been seen and there may be some really specific structure not mentioned by the describer. The length is given at .44 inch, and the habitat, Canada (North-west).

L. GEMELLUS, Kirby.—This species is only mentioned to complete the genus ; it is not nearly related to any of the others ; more elongate, elytra longer with four or five broad elevated interspaces separated by striæ-like impressions, each interspace with a depressed linear furrow, roughly scalerous, lines of denser white scales on the intervals simulating vittæ ; thoracic stripes and abdominal spots white, median elytral spot absent ; mesosternum as in *perforatus*, the femoral sinuosity a little more abrupt. Length .40-.50 inch. Habitat—Vancouver Island to Hudson Bay.

Though the genus has but recently been treated monographically, after disposing of *geminatus* and *alternans*, it was thought it might be useful to state briefly the characters assigned to the other species, as in all probability the large majority of the readers of the CANADIAN ENTOMOLOGIST will never see the memoir alluded to.

The genus *Lepyryus* affords grand opportunities for the creation of species to entomologists who form them on the same basis as those of rocks and minerals.

THE MALE OF MONODONTOMERUS MONTIVAGUS, ASHM.

♂.—About $4\frac{1}{2}$ mm. long, moderately dull brassy-green (about the colour of some species of *Dolichopus*, which it superficially resembles); third abdominal segment above blackish; tips of femora, and whole of tibiæ and tarsi, reddish-ochreous. Wings hyaline, veins dark brown. Antennæ black, scape greenish. Head rather finely punctate, rather broad, eyes prominent, vertex somewhat flattened. Antennæ rather short, scape very peculiar, irregularly reniform, the distal swelling largest; flagellum uniformly cylindrical, except the tip, which is transversely flattened. Thorax narrow, strongly punctate. Parapsidal grooves deep and complete. Scutellum with a transverse furrow, and its posterior margin occupied by a ridge which is foveolate above. Tegulæ green. Stigma bifurcated; post-marginal vein nearly twice as long as stigmal. Posterior femora beneath very finely denticulated, with one large tooth about the beginning of its distal fifth. Abdomen narrow, shining; first segment smooth on dorsum, remaining segments finely transversely striate. Second segment extremely narrow on dorsum.

Hab.—On leaf of *Populus*, sp., campus of N. M. Agricultural College, Las Cruces, N. M., May 8, 1895. (Ckll. 2945.)

This species was described from a ♀ taken by the writer at West Cliff, Colorado. The ♂, now first described, seems to differ considerably, and I should never have referred it to the same species, but for the fact that Mr. Ashmead assures me that the identity is certain. According to Howard's synopsis of the genera of Chalcididæ, it would not go into *Monodontomerus*, which has the posterior femora smooth beneath, except for the large tooth. The insect is a parasite of wild bees.

T. D. A. COCKERELL.

THE CIGAR CASE-BEARER OF THE APPLE (*COLEOPHORA FLETCHERELLA*).

BY JAMES FLETCHER, OTTAWA.

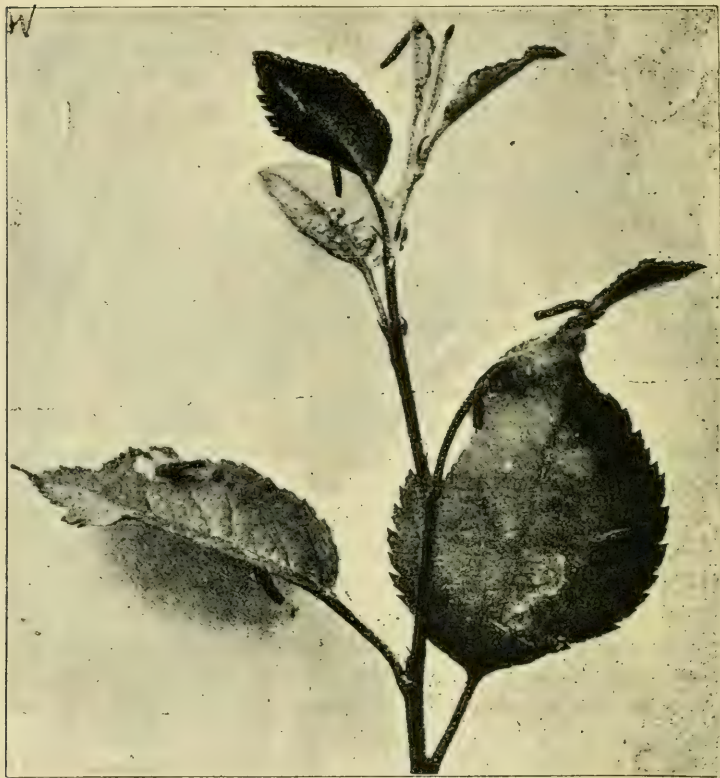


FIG. 12—CIGAR CASE-BEARERS AT WORK—NATURAL SIZE.

(Figure copied from Cornell Bulletin, No. 93, by M. V. Slingerland.)

In 1889 I received from the late William Brown, of Charlottetown, P. E. I., some larvæ of a small case-bearer, which he had found in large numbers upon his plum trees, and which also occurred in his pear and apple orchards. Since that time this insect has made itself well-known by its injuries in apple orchards in various localities in the Maritime Provinces, and in the Provinces of Quebec and Ontario. A beautifully

illustrated and carefully prepared bulletin has been issued by Mr. M. V. Slingerland, of Cornell University Agricultural Experiment Station, in which the life history of this most interesting but very serious enemy of the fruit grower is fully described. The above illustration, kindly lent by the editor of the Canadian Horticulturist, is copied from that bulletin.

The localities in Canada where this little pest has been most injurious are situated along the northern shore of Lake Ontario and the St. Lawrence. Dr. Young, of Adolphustown, in whose orchard of Duchess of Oldenburgh and Russet apples the first important occurrence of this insect as an apple pest was observed, states that they were first noticed in his orchard about 1885. Reports of its ravages have also been received from Oshawa, Port Hope, and Maitland, Ont., in all of which places it had an appreciable effect on the yield of the orchards.

The life history may be summarized as follows: The eggs, which are described by Mr. Slingerland as beautiful objects, are of a delicate light lemon-yellow colour, deeply pitted with triangular depressions separated by narrow ridges. They are very minute, and are deposited by the females among the hairs of the new shoots and on the under sides of the youngest leaves. The egg stage lasts about two weeks, the little caterpillars emerging in the latter half of July. For the first period of their lives they are miners feeding on the inner tissues of the leaves. After two or three weeks they make small, rather flat and elongated, curved cases, in which they pass the winter. These cases, inside which they live and which they carry about with them, are made of pieces of the upper and lower skins of the mined part of the leaf, lined inside with silk. The two surfaces of the leaf are easily recognizable on the cases from the pubescence of that side which was taken from the lower surface. Soon after making these winter cases, the caterpillars, now about a quarter grown, migrate to the twigs of the tree and fasten themselves securely to the bark. In badly infested orchards they are sometimes found clustered in hundreds around the fruit spurs.

As soon as growth begins the following year, about the beginning of May, the case-bearers crawl out to the opening buds, and at this time

their injuries are considerable, as they attack not only the young leaves, but also the flower buds. The winter curved cases are retained for a short time in spring, and are enlarged by the addition of small pieces of the skin of the leaves attached to the orifice, but after two or three weeks are discarded and another kind of case is made of the same material. This summer case, from which this insect takes its name, is shaped exactly like a miniature cigar. It is brown and very tough; the upper end is contracted abruptly into a three-limbed, star-shaped orifice, the lips of which fit closely together. Through this hole the excrement of the caterpillar is ejected, and ultimately the pretty little steel-gray moth will make its exit. The full-grown caterpillars, which are orange coloured, with black heads and dark feet, four millimetres in length, change to dark brown chrysalids inside the cases about the end of June, and the moths appear about three weeks later.

REMEDIES: The Cigar Case-bearer, when numerous, is a serious pest of the apple tree, and occasionally also of the pear and plum. The most injury results from the young caterpillars early in spring attacking the unexpanded buds, and later the flower stems, the forming fruit, and the foliage.

The results of experiments show that this insect can be controlled by spraying with Paris green and kerosene emulsion; but very thorough and persistent work is necessary. The best results have followed spraying the infested trees very early in the spring with kerosene emulsion, and repeating the operation once or twice at short intervals, four or five days later. The first application may be made with the standard Riley-Hubbard emulsion reduced with only five parts of water. After the leaves expand, the emulsion should be diluted with nine parts of water. Good results have also been obtained by spraying with Paris green (Paris green, 1 lb., quicklime, 1 lb., in 200 gallons of water). Now that the operation for spraying fruit trees with different compounds for the destruction of injurious insects and fungi is getting to be generally adopted by the best fruit growers throughout Canada, the only change necessary in the advised methods will be to spray rather oftener where this insect is known to occur.

NEW AMERICAN PARASITIC CYNIPIDÆ (ALLOTRIINÆ).

BY CARL F. BAKER, FORT COLLINS, COLO.

All of the species described below were taken in Colorado. For most of the specimens I am indebted to the industry of my wife, who has done a large amount of work with the sweep net in Northern Colorado. No American species have yet been described as belonging to any of the genera mentioned, though some of the species described under *Allotria* may possibly be referable to some one of them. A number of species of *Allotria* in my collection are left until such time as the already described forms are more fully elucidated.

Phaenoglyphis, Forster.

This genus is separated from *Allotria* by the parapsidal furrows and scutellar fovea.

Phaenoglyphis americana, n. sp.

Male.—Shining black, legs and antennæ honey-yellow. Length, 1 mm. Antennæ 14-jointed, approximate at base, sockets twice as far from eyes as from each other, reaching beyond the middle of the abdomen; joint 2 as long as 1, 3 twice as long and distinctly bent inwardly, 4 and 5 somewhat shorter than 2; apical joint long, conical, and blackish at tip. Oral region castaneous. Face, prothorax above, mesonotum at sides, scutellum, metathorax and base of abdomen with fine white hair, longest on the scutellum. Parapsidal furrows distinct, not approximate behind, gently diverging anteriorly and extending the entire length of mesonotum. Scutellum with a large semicircular fovea at base. Metanotum opaque and with two longitudinal carinæ, which are equidistant from each other and the lateral margins. Tegulæ piceous. Wings as long as whole body; median vein obsolete; radial cell closed, two and a-half times long as wide; appendix below long, slender, straight, and slightly knobbed at end; radius extending somewhat beyond juncture with marginal vein. Cubital and discoidal veins faintly outlined. Fort Collins; May.

Dylita, Forster.

Under this genus I describe several species in which the radial cell is open for a greater or less distance on the anterior border, and in which the radius is narrowly rounded at tip and does not reach the margin of the wing. Some of the species resemble quite closely various species of *Alloxysta*, but in that genus the radius spreads out irregularly at tip, and there is no appreciable space between it and the margin of the wing.

The following characters are common to all the species described below: Antennæ reaching to between middle and tip of abdomen. Pubescence very sparse, except on metathorax and base of abdomen, where it is short and thick, and on scutellum, where it is long and thin. Prothorax below, a triangular sclerite below tegulæ, and metathorax, opaque and minutely roughened. Tegulæ piceous. Wings as long or slightly longer than the whole body; median vein obsolete.

Dylita bicolor, n. sp.

Female.—Shining black, legs honey-yellow, antennæ piceous beyond joint 4. Length, 1.25 mm.

Antennæ 13-jointed, sockets at middle of face and as far from eyes as each other; flagellum becoming distinctly wider and heavier toward the tip; antennal joint 2 three-fourths the length of 1, 3 equalling 1 in length, 4 and 5 subequal in length to 2; apical joint becoming wider for about two-thirds its length, then rapidly narrowing to a point; four basal joints same colour as legs. Oral region rufous, palpi honey-yellow. Radial cell long, triangular, two and a half times as long as wide, terminal abscissa of radius broadly rounded, appendix below short, strongly bent, knobbed at tip. Fort Collins; June.

Dylita ruficeps, n. sp.

Female.—Shining black, head and antennæ beyond joint 4, dark rufous; legs honey-yellow. Length, 1.25 mm.

Antennæ 13-jointed, sockets above middle of face, nearer to each other than to the eyes; flagellum but little wider toward the tip; joint 3 somewhat longer than 1, 2 three-fourths the length of 3, 4 and 5 subequalling 2 in length; apical joint evenly narrowed to a point and much longer than anteapical. Mandibles honey-yellow, piceous at tips and bidentate. Palpi sordid white. Radial cell triangular, two and one-third times as long as wide, terminal abscissa of radius strongly irregularly bent, appendix below long, angularly bent at extremity. Fort Collins; June.

Differs from *bicolor* in size, colour of head, antennæ, and venation.

Dylita affinis, n. sp.

Female.—Length, 1.25 mm. Closely related to *D. ruficeps*, from which it differs as follows: Head of same width, but shorter, of a very pale bright rufous, with the space between the ocelli dark. Joint 4 of antennæ nearly as long as 3, and slightly longer than 2; sockets above middle of

face, distance between them equalling distance to eyes. Appendix below radial cell long and straight. Fort Collins ; September.

Easily separated from *ruficeps* by the above characters.

Dylita coloradensis, n. sp.

Male.—Black ; head, prothorax, and all pleuræ, pale rufous ; antennæ and legs honey-yellow. Length, 1.5 mm.

Antennæ 14-jointed, sockets above middle of face, as near eyes as each other ; flagellum not enlarging toward the tip ; joint 2 three-fourths of 1, 1 - 3 - 4 and 5 subequal : apical joint conical and not longer than anteapical. Metanotum with two distinct carinæ which converge slightly anteriorly. Radial cell triangular, little more than twice as long as thick, terminal abscissa of the radius somewhat curved, appendix below long, straight, gradually enlarged toward the extremity. Fort Collins ; June.

Readily distinguished from the above species by coloration.

Dylita similis, n. sp.

Male.—Length, 1.5 mm. Very similar to *D. coloradensis*, from which it differs as follows: Space between ocelli dark. Antennæ becoming piceous beyond joint 4. Radial cell longer and more pointed, two and one-half times as long as wide, terminal abscissa of the radius nearly straight, appendix below curved. Fort Collins ; September.

Alloxysta, Forster.

In this genus (or subgenus) the radius reaches the anterior margin of the wing, but the radial cell is open anteriorly. The following characters are common to all the species described below : Antennæ reaching to between middle and tip of abdomen, sockets at middle of face, as near eyes as each other. Pubescence very sparse, except on metathorax and base of abdomen, where it is short and thick, and on scutellum, where it is long and thin. Prothorax below, a triangular sclerite below tegulæ, and metathorax, opaque and minutely roughened. Tegulæ piceous. Wings as long or slightly longer than the whole body ; median vein obsolete.

Alloxysta robusta, n. sp.

Female.—Shining black, antennæ at base and legs honey-yellow. Length, 1 mm.

Antennæ 13-jointed, piceous beyond joint 4 ; flagellum strongly enlarging toward tip ; joints 1, 2 and 3 subequal in length, 4 and 5 somewhat shorter than 3 ; apical joint conical, longer than anteapical. Oral

region rufous, palpi honey-yellow. Abdomen short but very deep, the depth half again the length. Radial cell large, long triangular, length two and a half times the width, terminal abscissa of the radius gently curved, appendix below bent. Fort Collins; June.

Alloxysta longiventris, n. sp.

Female.—Shining black, antennæ at base and legs honey-yellow; head with vertex piceous, all below pale rufous. Length, 1 mm.

Antennæ 13-jointed, dark rufous beyond joint 4; flagellum strongly enlarged toward tip; proportions of antennal joints as in *robusta*. Metanotum with two longitudinal carinæ which converge slightly anteriorly. Abdomen nearly as long as the thorax, slender, upper and lower lines subparallel. Radial cell small, short triangular, length two and a third times the width, terminal abscissa of the radius strongly curved, appendix below straight. Fort Collins; May.

In the form of the abdomen this species differs widely from any other Allotriid I have seen. The abdomen of *A. robusta* differs from the normal form in exactly the opposite direction.

Alloxysta magna, n. sp.

Female.—Large, robust; shining black; antennæ at base and legs honey-yellow; head rufous, slightly darker above. Length, 1.6 mm.

Antennæ 13-jointed, piceous beyond the fourth joint; flagellum subfiliform, scarcely enlarging toward the tip; joints 1, 3 and 4 subequal, 2 about three-fourths as long, apical joint conical at tip, longer than the anteapical. Metanotum with two longitudinal carinæ which converge slightly anteriorly. Abdomen globular, as deep as long, and scarcely pointed behind. Radial cell large, triangular, length two and a half times the width, terminal abscissa of the radius strongly curved, appendix below short and straight. Fort Collins; June.

The largest species I have seen, and with the abdomen more nearly globose.

Alloxysta gracilis, n. sp.

Female.—Shining black, antennæ at base and legs honey-yellow; head pale rufous. Length, 1.25 mm.

Antennæ 13-jointed, piceous beyond joint 4; flagellum subfiliform; joint 3 equals one in length, 2 three-fourths as long, 4 and 5 somewhat shorter. Abdomen from the side subtriangular, strongly pointed behind. Radial cell of medium size, two and a half times as long as wide, terminal

abscissa slightly curved, appendix below heavy and straight. Fort Collins ; September.

Differs from *magna* in size, shape of abdomen, etc.

Alloxysta apicalis, n. sp.

Female.—Shining black, antennæ at base and legs honey-yellow, head pale rufous ; abdomen light reddish-brown, black at tip. Length, 1.4 mm.

Antennæ 13-jointed, piceous beyond joint 4 ; flagellum slightly heavier toward the tip ; joints 1, 3 and 4 subequal, 2 a little shorter ; apical joint conical at the tip, longer than the anteapical. Abdomen from the side subtriangular, pointed behind. Radial cell large, two and a half times as long as wide, terminal abscissa slightly curved, appendix below slender, strongly knobbed at the tip. Fort Collins ; September.

Readily recognized by the peculiarly coloured abdomen.

Alloxysta rufipleura, n. sp.

Male.—Shining black, antennæ at base and legs honey-yellow ; head, prothorax, and all pleura bright rufous. Length, 1.25 mm.

Antennæ 14-jointed, dusky beyond joint 5 ; flagellum subfiliform ; joints 1, 3 and 4 subequal, 2 a little shorter, 3 somewhat swollen at the apex beneath ; apical joint conical, little longer than anteapical. Abdomen from side subequilaterally triangular, strongly produced and pointed below. Radial cell of medium size, two and one-half times as long as wide, terminal abscissa of the radius strongly curved, appendix below rather long and emarginate on the proximal side. Fort Collins ; June.

Separated from all the above species by the partially rufous thorax.

Alloxysta abdominalis, n. sp.

Female.—Dark shining piceous, abdomen and thorax lighter ; head and metathorax rufous ; antennæ at base and legs honey-yellow. Length, 1 mm.

Antennæ 13-jointed, piceous beyond joint 4 ; flagellum slightly enlarged toward the tip ; joints 3 and 4 shorter than 1 and but little longer than 2 ; apical joint slender, conical, very long, a half longer than the anteapical. Abdomen from the side subequilaterally triangular. Radial cell shorter and broader than in *rufipleura*, the terminal abscissa of radius gently curved, appendix below slender, curved, knobbed at tip. Fort Collins ; June.

Resembling *rufipleura*, but differing in size, and antennal and wing characters. It is hardly possible that this could be the female of *rufipleura*.

NOTES ON BEES OF THE GENUS *PROSOPIS*, WITH
DESCRIPTIONS OF NEW SPECIES.

BY CHARLES ROBERTSON, CARLINVILLE, ILLINOIS.

Prosopis affinis, Sm.

Twenty-four male and female specimens sent to Mr. Cresson in 1887 were identified as this species. Since that time I have regarded it as a variable species, and in my last paper (Trans. Am. Ent. Soc., XXII., 116) indicated it as a synonym of *P. modesta*, Say. I now think there are two species, closely allied, but characterized as follows:—

Prosopis affinis, Sm., ♀.—Black, head and thorax opaque, closely punctured; abdomen almost impunctate, first segment smooth and shining, lateral apical margin with a patch of whitish pubescence; flagellum testaceous beneath; subtriangular mark on each side of face, two spots on collar, tubercles, spot on tegulæ, edge of wing base beyond tegulæ, and base of all the tibiæ, lemon-yellow; enclosure of metathorax strongly rugose at base; wings hyaline. Length, 5–6 mm.

♂.—Resembles the female; first segment of abdomen less shining, more punctate, apical margins of segments subtestaceous and subfasciate; face below antennæ, ascending broadly on each side nearly to summit of scape and notched around insertion of antennæ, labrum, mandibles, except rufous tips, concave exterior edge of scape, two spots on collar, spot on tegulæ, edge of wing base, tubercles, tarsi, and tibiæ, except a spot behind anterior and middle pairs and ring on posterior pair, lemon-yellow. Length, 5–6 mm.

Illinois; 16 ♂, 11 ♀ specimens.

Four males differ only in having no yellow on scape; one of these also without a spot on tegulæ.

I think there is no question but that this is the *P. affinis* of Smith, but the male described by him probably does not belong to it. If, however, this should prove to be distinct from *P. affinis*, the name of *Prosopis ziziæ* is proposed for it.

Prosopis modesta, Say, ♀.—Closely resembles the female of *P. affinis*; wing a little more dusky, the extreme base without yellow, tegulæ rarely with a small spot in front. Length, 4–6 mm.

♂.—Scape stout, not strongly concave exteriorly, as in preceding; first segment of abdomen less punctate, more smooth and shining; face below antennæ, narrowing to a point on each side at eye margin; two

spots on collar, tubercles, anterior tibiae in front, middle and posterior pairs at base, and the tarsi, yellow; the tarsi paler. Length, 5-6 mm.

Illinois; 24 ♂, 27 ♀ specimens.

Thirteen male specimens agree with the description; six have a yellow line on mandibles; five have a yellow spot on labrum; three have no spots on collar; two have spots on tegulae, and one has the scape yellow exteriorly. Twenty-two female specimens have the tegulae immaculate; five have small spots on tegulae in front, two individuals of these showing the spot only on one side. This is the commonest species in my neighbourhood. I have taken the sexes in copula. This is the *P. affinis* of Cresson (Proc. Bost. Nat. Hist., xii., 270).

Smith mentions a spot on tegulae in *P. affinis*, while Say does not mention it in *P. modesta*. It is quite probably that Say's description was based on specimens taken in Indiana. This is the only species taken here which agrees with his description. What Say described as the male belongs to *P. pygmaea*, Cr. The female of *P. pygmaea* usually has a spot on tegulae, but not on collar.

Prosopis pygmaea, Cress.

Of twenty-seven female specimens taken here (Carlinville, Illinois), all except nine show a spot on clypeus, two showing three spots; only one shows no spot on the tegulae; all have spots on tubercles and side of face, and no spots on collar. The females without spots on face and tubercles are referred to next. (See Trans., XXII., 116.) Of twenty-three males, fourteen have no spots on tegulae, while two show no spots on tubercles and are without the yellow club-shaped extension of the facial markings.

Prosopis saniculae, n. sp., ♂.—Black, opaque, the abdomen more shining; head and thorax closely and rather finely punctured; abdomen almost impunctate; enclosure of metathorax more rugose than in *P. pygmaea*; form slender; scape very broad, club-shaped; flagellum beneath and apical margins of abdominal segments somewhat testaceous; a subquadrate spot on clypeus, a smaller spot above, a narrow line on each side of face, anterior tibiae in front, middle and hind pairs at base, and the tarsi, yellow; face on each side near insertion of antennae with a rounded depression which is smooth and shining; wings hyaline, nervures and stigma dull testaceous. Length, 4-5 mm.

♀.—A narrow line on each side of face, sometimes wanting, and the tibiæ at base, yellowish. Length, 4-5 mm.

Illinois; four ♂, three ♀ specimens.

Prosopis Illinoisensis, n. sp., ♂.—Black, head and thorax opaque, densely, rather strongly and coarsely punctured; abdomen shining, especially the first segment, which is impunctate, the remaining segments finely punctured; metathorax rather strongly rugose; scape stout; face below antennæ, widening above on each side and somewhat notched about their bases, small spot on labrum, and sometimes on mandibles, two spots on collar, tubercles, anterior and middle tibiæ in front, hind tibiæ entirely, and the tarsi, yellow: wings dusky toward tips. Length, 6 mm.

Illinois; three ♂ specimens.

NOTES ON NEW MEXICO AND ARIZONA HYMENOPTERA.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

(Continued from page 112.)

Diodontus occidentalis, Fox.—Las Cruces, N. Mex. Name com. by Prof. Cockerell. Det., Fox.

Diadasia enavata, Cress.—Las Cruces, N. Mex., August 19. Two. Clypeus black. Det., Fox.

Elis (Dielis) plumipes, Drury.—Las Cruces, N. Mex., August 19. Two. Det., Riley.

Epeolus, sp.—Chaves, N. Mex., August 6. One. A moderately large hornet-shaped species, most beautifully velvety all over, entirely black below, including legs. Thorax black, with circular border light velvety yellow extending on pleura. Abdomen black with light velvety yellow cross-band on segments 1 to 4, those on segments 1 and 2 on hind portion near hind border and projected laterally forward, on first segment the lateral yellow also projected inward on anterior edge. Wings smoky. There seems to be very short pubescence on the thorax, but that on the abdomen is extra short, or is, as it appears, pollen. Det., Fox.

Epeolus occidentalis, Cress.—Turkey Tanks, Arizona, July 18. One specimen. A small hornet-shaped species, with thorax black and yellow vittate, abdomen black and yellow banded, wings slightly smoky, and legs fulvous. Det., Fox.

Eucerceris, sp.—Grant, Valencia County, N. Mex., August 3. One. A yellow and black chrysidid-like hornet. Det., Riley.

Evania, sp., ♂.—Las Cruces, N. Mex., September 9. One. A small blackish and rufous gall-fly (?), with immense thorax and very small pedunculate abdomen. Det., Riley.

Gorytes dentatus, Fox., n. sp.—Grand Canyon, Arizona; Hance trail, July 11. One specimen. A small rufous and yellow hornet. Wings hyaline, anterior pair brownish near tip. Det., Fox.

Halictus ligatus, Say.—Hart Little Spring, Arizona, July 14. One specimen. A small blackish bee. Det., Fox.

Hedychrum violaceum, Brullé.—Chaves (near Los Lunas), N. Mex., August 6. One. El Rito, N. Mex., August 5. One. Det., Fox.

Ichneumon comes, Cress.—San Francisco Mt., Arizona, July 15. One specimen. A black ichneumonid with two yellow bands on abdomen at base, and fulvous-yellow legs. Det., Fox.

Megachile, sp.—Chaves (near Los Lunas), N. Mex., August 6. One specimen. A moderately large species, mostly black; nearest to following species, but with more elongate abdomen, and slightly stouter. Det., Fox.

Megachile, sp.—Las Cruces, N. Mex. One. Clypeus black. ♀. Chaves, N. Mex., August 6. One. Det., Fox.

Megachile relativa, Cress., ♀.—Hart Little Spring, Arizona, July 14. One specimen. A grayish pilose bee, pile of abdomen fulvous and in bands, rest of abdomen showing shining black. Det., Fox.

Megacilissa gloriosa, Fox.—El Rito, N. Mex., August 5. One specimen. Large species, fulvous-yellow pilose, including first abdominal segment, rest of abdomen black with white pilose narrow hind borders to segments 2 to 4. Wings clear. This was a new species, recently described by Mr. Fox.

Megacilissa Yarrowi, Cr.—Las Cruces, N. Mex., August 21. One. A large yellowish-fulvous pilose bee, with dorsum black except last abdominal segment. Front wings black, except bases. Det., Fox.

Melecta interrupta, Cress.—La Vega de San José, N. Mex., Aug. 4. One. Continental Divide, Tenaja, N. Mex., August 2. One. Det., Fox.

Mellisodes, n. sp.—El Rito, N. Mex., August 5. One ♀. Much like *M. obliqua*, Say, ♀, but larger and more yellowish-fulvous pilose on abdomen and especially on thorax. Wings clear. Det., Fox.

Mellisodes menuacha, Cress., ♀.—Las Cruces, N. Mex. One ♀. Det., Fox.

Mellisodes montana, Cress., ♀.—Las Cruces, N. Mex., August 19. One. A species of moderate size, fulvous pilose, including basal abdomi-

nal segment, rest of abdomen black with pale yellowish pubescent bands on segments. Wings clear. Det., Fox.

Mellisodes obliqua, Say, ♀.—Las Cruces, N. Mex. One. Clypeus black. Det., Fox.

Nomia, n. sp.—La Vega de San José, Valencia County, N. Mex., August 4. One. Det., Fox.

Nototrachys texanus, Cress., ♀.—Continental Divide, Tenaja, N. Mex., August 2. One. A small, dark rufous ichneumonid. Det., Riley.

Odynerus, sp.—Las Cruces, N. Mex. A specimen caught in the act of extracting one of the mesquite tineid bag worms from its case [for description of this tineid see *Zoe*, IV., pp. 226-228]. A small black and yellow hornet. Det., Riley.

Odynerus, sp., near *annulatus*, Say.—Grand Canyon, Arizona. Hance trail, July 11. Two specimens. Det., Fox.

Osmia, n. sp.—Las Cruces, N. Mex. One ♀. A small species, with dark green abdomen. Thorax black, dark fulvous pilose above. Wings slightly smoky. Det., Fox.

Pelopaeus Servillei, St. Farg.—El Rito, N. Mex., August 5. One. Turkey Tanks, Arizona, July 18. One. Det., Fox.

Pepsis formosus, Say, ♂.—Grand Canyon, July 11. Only one specimen. This is the smaller black form with blue reflections, and with brownish-yellow wings, which are blue at base. Many have been taken at Las Cruces, N. Mex. Det., Fox.

Perdita, sp.—Las Cruces, N. Mex. Name com. by Prof. Cockerell. Det., Fox.

Philanthus, sp.—Hart Little Spring, July 14. One. A good-sized black ichneumonid with red abdomen. Det., Fox. (?) *.

Pompilus, sp. (new to U. S. Nat. Mus. Coll.)—La Vega de San José, N. Mex., August 4. One. A small purplish-black wasp. Det., Riley.

Pompilus aethiops, Cress.—La Vega de San José, N. Mex., Aug. 4. One. A wasp of a soft black colour with a faintly purplish tinge. Det., Riley.

Pompilus formosus, Say.—Las Cruces, N. Mex. Common August 21 and other dates. Four large ones measure from 4 to 4½ cm. long.

Ptenus, sp.—La Vega de San José, N. Mex., August 4. One. A sawfly. Det., Riley.

Scolia dubia, Say.—La Vega de San José, N. Mex., August 4. Two. Det., Riley.

Scolia haematodes, Burm.—La Vega de San José, N. Mex., August 4. Five specimens. This is a large black species, with apical two-thirds of abdomen yellowish-orange. Wings purplish-blue. The extra-melanic colours of the bristly pile vary from yellowish or dull orange to deep crimson. Det., Riley.

Scolia Lecontei, Cress.—La Vega de San José, N. Mex., August 4. Four. Det., Riley.

Smicra, sp.—Grand Canyon, Arizona; Hance trial. Three specimens. July 8 and 11. Det., Fox.

Sphaerophthalma, sp., ♂.—Zuni River, Arizona, July 28. One. This winged specimen has the thorax and last two-thirds of abdomen yellowish or slightly orange pilose, the rest being wholly black. Det., Riley.

Sphaerophthalma bexar, Blake, ♂.—Continental Divide, Tenaja, N. Mex., August 2. One. Chaves, N. Mex., August 6. One. Det., Riley.

Sphaerophthalma coccineohirta, Blake, ♀.—Carrizo, Arizona, July 22. One. This mutillid differs strikingly from the forms more ordinarily met with, by having the dorsum not alone of abdomen, but also of thorax and head, with crimson-red hair. Det., Riley.

Sphaerophthalma creusa, Cress.—Las Cruces, N. Mex. Name com. by Prof. Cockerell. Det., Fox.

Sphaerophthalma gloriosa, Sauss., ♀.—Grant County, N. Mex. [W. J. Howard, 1882]. One specimen. This peculiar mutillid is clothed on whole dorsum with grayish-white long hair. Det., Riley.

Sphaerophthalma gorgon, Blake, ♀.—Las Cruces, N. Mex. Three specimens. This is a large mutillid, all black, except dorsum of abdomen with orange-yellow hair. A larger ♀ specimen, taken in St. Joe, Arizona, July 21, has the hair of abdomen crimson-red, except base of abdomen, which with all the rest bears black hair. It is identified as same species. Det., Riley.

Sphaerophthalma occidentalis, Linn., ♂.—Zuni River, Arizona, July 28. One. Continental Divide, Tenaja, N. Mex., August 2. One. Det., Riley.

Sphecius speciosus, var. *grandis*, Say.—Las Cruces, N. Mex. One. Large species, colours yellow, rufous, and dark brown. Det., Riley.

Sphex, sp.—Las Cruces, N. Mex. One. A large black wasp, with orange-yellow legs and abdomen. Det., Riley.

Sphex ichneumonea, Linn.—La Vega de San José, N. Mex., Aug. 4. One: El Rito, N. Mex., August 5. One. Det., Riley.

Tachytes fulviventris, Cress.—Chaves, N. Mex., August 6. One. Sabinal, N. Mex., August 7. One. First three abdominal segments of this specimen clear, light orange, and other two segments black. Det., Fox.

Tenthredo flavomarginis, Norton.—San Francisco Mt., Arizona, July 15. One specimen. Blackish sawfly. Very nearly the same as *T. xanthus* and *occidentalis*, but without bands across the abdomen, which is wholly black. Det., Fox.

Tenthredo occidentalis, Cress.—Hart Little Spring, Arizona, July 14. Eight specimens. Like *T. xanthus*, only the abdominal bands are red instead of yellow. Det., Fox.

Tenthredo xanthus, Norton.—Hart Little Spring, Arizona, July 14. Two specimens. This is a black species with two pure yellow bands across the abdomen. Det., Fox.

Thyredon arnatipennis.—Grand Canyon, Arizona. Hance trail, up near rim, July 12. One specimen. A very large ichneumonid, with laterally compressed and petiolate abdomen. Mostly flavous. Thorax stout. Antennæ long, yellow. Wings flavous-hyaline, with extremities and posterior border black. Det., Fox.

Trypoxylon Texense, Sans.—La Vega de San José, N. Mex., Aug. 4. Three specimens. Det., Fox.

Urocerus abdominalis, Harris.—Summit of San Francisco Mountain, Arizona. Nearly 13,000 feet. Many specimens seen, three captured July 15. The abdominal segments 2 to 5 of this species are bright yellow, rest of body wholly soft black. Eyes and legs partly yellowish. Det., Fox.

Vespa occidentalis, Cress., var.—Hart Little Spring, Arizona, July 14. One collected. Many seen. A large yellow and black hornet. Det., Fox.

Xylocopa Arizonaensis, Cress.—Las Cruces, N. Mex., August 19. One. Det., Fox.

NOTE.—Mention was inadvertently omitted, in the introductory remarks, of a paper on ants from Las Cruces, N. M., sent to *Entom. News* (1894) for publication, and which records twelve species.

The Canadian Entomologist.

VOL. XXVIII.

LONDON, JUNE, 1896.

No. 6.

THE LARGER SPECIES OF ARGYNNIS, AND THE MYSTERY OF THEIR LIFE HISTORY.

BY H. H. LYMAN, M. A., MONTREAL.

Although the larger species of *Argynnis* which fly in the Eastern part of this Continent are known in all their stages, through the most valuable labours of Mr. William H. Edwards, there are certain problems in regard to their life history which have baffled the efforts of all the entomologists who have attempted to solve them.

On page 124, of Vol. VI. of CAN. ENT., Mr. Edwards wrote as follows :—

“There are one or two points in the life history of the larger Argynnides that are not yet clear. With us, *Cybele* male is on the wing from the 25th of May to the 10th of June, as I have noticed for several successive years. Probably *Aphrodite* nearly as soon, and *Diana* first appears about the 20th of June. Shortly after the 1st of June the female of *Cybele* is to be seen, and both sexes abound in the clover fields. By the end of June *Cybele* has become scarce, and the individuals to be seen have lost their freshness and are broken and worn. It is certain that these early appearing females have not matured eggs and laid them, because at no time from June to August will anything but rudimentary eggs be found by dissecting, and the eggs do not become distinguishable to the eye until August. They then mature rapidly, and in a few days attain full size. I am confident that no eggs are laid till August. But about the first of that month, and all along to near the end of it, there appear in great numbers both fresh males and females, as if just from chrysalis, with no abrasion of the hairs on thorax between the wings, which spot is the first to show wear. (I doubt if an *Argynnis* could fly two days without thus giving evidence of it.) There are flying at the same time many worn individuals, especially females. These last are the first to deposit their eggs, but shortly after, and up to the time of frosts, the others also are in condition to do the same. I see no other explanation of the appearance of these freshly emerged butterflies than that they have formed part of the brood of caterpillars hatched the previous fall, some of which brood yielded the butterflies that came out in May and June, and the remainder continued in the larval or chrysalis state until August, and upon these last the perpetuation of the species largely depends, for nine-tenths of the June flight must have been destroyed long before August. If I am right the preparatory stages of the August *Cybele* must consume eleven months out of the twelve.”

On page 73, of Vol. XII., CAN. ENT., Mr. Edwards referred to the above extract and then continued as follows :—

“I now am of the opinion that there are two annual broods. The experience in fall of 1878, with those larvæ of *Alcestis* which proceeded to feed instead of going into lethargy, and passed two and three moults within a very much shorter period than has been observed in the spring, showed that six weeks in midsummer might not improbably be long enough for all the changes. Perhaps also there are but four larval moults in the summer brood, as in some of the *Melitæas*, though there are five in the winter brood. Every stage would be shortened by the hot weather of July. On 14th June, 1878, I saw a pair of *Cybele* flying in copulation. In all instances where this has happened with butterflies under my observation, and the females have been secured (and this includes *Arg.*, *Atlantis* and *Myrina*), eggs have been laid within a few hours after. Eggs laid 15th June would allow about two months for the several stages to imago.”

In Mr. Scudder's *Butterflies of New England*, on page 549, after quoting in full the first of the above extracts, the author proceeds :—

“No such interrupted series of emergences has been detected in the history of our three species in New England, but if, as is probable, this is a first step towards true digoneutism, it might well be looked for in Southern New England, and should especially be sought for in *A. Cybele*.”

Mr. Scudder proceeds to say that in the North there is a prolonged but uninterrupted emergence of fresh material from the chrysalis and suggests that the phenomena may be attributed to lethargy in the caterpillar, periodic and fixed in the South, casual and irregular in the North.

The life history is given by Mr. Scudder as follows :—

“The insect is single brooded in New England, passing the winter in the larval state. The caterpillars become full grown in June, and the earliest butterflies appear in the latter part of June, sometimes as early as the 16th in the latitude of Boston, usually not much before the 21st; become common by the 1st of July, when the female first emerges; continue to escape from the chrysalis until at least the middle of July, and fly until the middle of September and occasionally later. The butterflies generally pair at the end of July, but the eggs do not begin to assume their proper size until about the middle of August, and are not laid until the last of August or first of September. Miss Soule obtained eggs in Stow, Vt., on August 20, which is the earliest New England date known to me.”

“The eggs hatch in about fifteen days, but the caterpillars from them go immediately into hibernation without eating anything more than their egg shells.”

From 1868 to 1875, inclusive, I spent the summers, from about the 15th July to the first week in September, on Cape Elizabeth, near Portland, Me., and I observed the phenomena of the second emergence described by Mr. Edwards. When I first arrived the *Argynnides* were flying, but in a worn and dilapidated condition, but about the 1st of August fresh examples appeared and I observed them in copulation with some of the worn ones, but later only those of the second flight were seen in coitu.

On 1st July, 1891, when on a Dominion Day excursion to Vaudreuil, Q., I observed a pair of *A. Cybele* in copulation, resting on a bush within a yard of where I was standing. Oblivious for the time of the interest and importance of the fact, I did not secure them, and so lost the opportunity of trying to obtain eggs at that time.

On 2nd July, 1894, I went out to St. Therese to look for females of *Cybele*, but though plenty of males were on the wing, no female was seen.

On 14th July I went up the mountain for the same purpose and was fortunate enough to secure one in fair condition. This I immediately confined over a violet planted in a pot, by a wire gauze cylinder, but fearing that the eggs might possibly be laid upon the wire gauze, I substituted a net cage on the 15th. This cage was kept out of doors on a back gallery, but on the 18th was upset and demoralized by a too inquisitive feline anxious to find out what sort of a bird was kept in such an insecure cage.

On my return home in the evening I proceeded to examine the wreck, though I supposed the butterfly had escaped, but on carefully stirring the spilled earth the poor thing struggled out of its grave and was carefully secured, and on examination was found to be sound, though with sadly damaged plumage.

Two days later I carried it out in a box to Paul Smith's, in the Adirondacks, whither I went to look for *Colias Interior*, and rigged up a fresh cage for it by planting a violet in a tomato can. I cannot be sure when the first eggs of *Cybele* were laid, but the two first found were observed on 30th July, which is three weeks earlier than any previous record for anywhere near this latitude, according to Mr. Scudder, but, curiously enough, is the same date as recorded by Wm. Buckler for *Argynnis Paphia* in the first volume of "Larvæ of British Butterflies and Moths," as noted by Mr. Scudder.

This female lived for 29 or 30 days in confinement, and laid eggs at various times up to about 12th August. Comparatively few eggs were laid and most of them hatched in due course, the first on 18th August, giving an egg period in hot summer weather of not less than 19 days and probably longer. This larva behaved in a very curious manner and was a subject of much interest. It was placed on a violet planted in a small pot and left out over night without any cage and in the morning it could not be seen and I feared it had escaped, but placed a small wire gauze cylinder over the plant.

On the 20th it was carried with the rest of my menagerie on a holiday trip to Murray Bay, Q., and on 23rd was found crawling about on the plant and it looked larger than when placed upon it.

On 25th, I observed it feeding on one of the young, unexpanded leaves near the roots, in the morning and also at lunch time, but by evening it had disappeared from view.

On 26th, observed larva in the evening resting near the roots.

On 27th, found in same place in the morning ; at 1:40 p. m. it was half way up the stem of one of the leaves, and at 3:10 p. m. in the same position.

On 28th, in morning, it was in same position ; later it was seen crawling about the lower curved stems ; by evening it had disappeared.

On 29th, still in hiding ; later discovered it resting on a leaf-stalk near leaf.

On 30th, in same position on leaf-stalk, but found that a little had been eaten out of each side of the approximate edges of the leaf ; the eating on each side made the injury to the leaf extremely inconspicuous. At 1:15 p. m., found it on this leaf for first time, later it disappeared.

On 31st, still in hiding.

On 1st September, found larva had left plant, which had been left uncovered since 23rd, and was on the shelf ; replaced it on the plant and put wire gauze over it. Found remains of an egg shell on the plant.

On 2nd September, larva on leaf, then on stem of another leaf ; later had disappeared.

On 4th, I left for Quebec by the day boat and placed my paraphernalia in what I thought was a safe place in the saloon, but some one knocked the wire gauze cover partly off the pot and this larva apparently escaped, for I never found it again. It had lived and fed sparingly for seventeen days, and had grown slowly but perceptibly, although it had not passed a moult.

Three more eggs hatched on 5th Sept. and another on 6th, but though I found, on the 7th, a leaf a little eaten, the larvæ did not seem inclined to feed, but seemed to rest most of the time in a lethargic condition.

These eggs which hatched last must have been laid not later than 11th or 12th of August at the latest, which would make the egg stage not less than about 24 or 25 days, but the climate at Murray Bay would doubtless

retard their development somewhat. At least one egg did not hatch, though the larva seemed to be fully developed inside it. As soon as I found that these larvæ would not feed and that they seemed to be shrinking in size, I put them into a small pill box and the unhatched egg in another and placed them along with a pill box containing larvæ of *Colias Interior*, in a wide mouthed glass jar, with a bung to close the mouth, and put it in the refrigerator. Some time afterwards I found that by some means water had got into the jar and the boxes were wet and mouldy, and so took them out. The larvæ were still alive, so I placed them out of doors, and later, when the snow came, I put them in a box and buried them under the snow. The *Colias* larvæ survived the winter, but these did not.

On the 10th of June last I went out in the evening to St. Therese on an entomological quest, and the next day I found *Cybele* ♂ on the wing. Messrs. Winn and Gibb have also found it as early, and I think that this early appearance in this latitude proves that these early fliers could not have come from larvæ which hibernated direct from the egg, but that the larvæ must have passed one or more moults before hibernation. Mr. Edwards found the pupal period to be 22 to 24 days, in Virginia, in some cases and from 16 to 20 days in others. Now, it is probable that in this latitude the period would be as long as the longest in Virginia, but even the shortest would carry back pupation into the month of May, and as the snow often lies till late in April and the early part of May is frequently cold, it would only leave four or five weeks of cool weather for the full growth of this larva, which is said to be decidedly sluggish in its growth, which seems to me utterly impossible. *Colias Interior*, which passes one moult before hibernation, develops rapidly, and has a pupal period of only about ten days; does not attain the imago state in the Adirondacks for several weeks later, though the ones reared by me in confinement had their period of emergence accelerated by about three weeks.

My experiments so far have produced rather negative results, but they prove that eggs are laid in July, that the resulting larvæ sometimes feed and grow perceptibly, and, I think also, that the species flies too early in this latitude to have come from larvæ which hibernated direct from the egg.

I do not like theorizing upon such insufficient data, but I am inclined to the hypothesis that there are two almost distinct cycles of this species

which overlap somewhat, some of those of the earlier cycle living until after the appearance of those of the later one, and in some instances mating with them.

Upon this hypothesis the larvæ which hibernated direct from the egg would all start feeding at about the same time and so would account for a simultaneous appearance of many fresh specimens about the beginning of August, while those which emerge over a considerable time in the early summer would be from those larvæ which had passed one or two moults the previous year.

Mr. Edwards's later view, that there are probably two broods in Virginia, the one descended from the other, I hold to be untenable in view of the long egg period, even in the heat of early August. Nor am I inclined to accept as probable the suggestion of Mr. Scudder, based upon the experience of Vaudouer in the case of the European *Euphrosyne*, of a lethargic period in the case of that portion of the brood which does not reach the imago state till August.

I hope to pursue my experiments further, and to that end appeal for the assistance of other lepidopterists, and will gladly pay, either in money or exchange, for living specimens of the female of this species sent me not later than the first week in July. These can be sent by mail in suitable boxes addressed to me at 384 St. Paul St., Montreal.

TRYCHOSIS TUNICULA-RUBRA, N. S.

REV. THOMAS W. FYLES, SOUTH QUEBEC.

While studying the habits of *Gelechia gallæ-diplopappi*, I have repeatedly met with a parasite, in the galls of the moth, that I have not found elsewhere.

I have submitted imagos of the species to several of our most eminent hymenopterists, and all agree that the species is new to science and undescribed. To Mr. Ashmead I am indebted for the information that it will properly come into Föster's genus *Trychosis*.

The full-grown larva of the species is a fusiform, legless grub, three-tenths of an inch long, and having thirteen segments, counting the head. The anal segment is somewhat elongated. The creature is of a white waxen appearance, with a tinge of pink; and it has a few short hairs on its face and along the back and sides. The spiracles are well defined. On the ventral surface of the grub are a number of extensile and retractile pads or pseudopodia, by the aid of which it fastens itself to its victim, or

moves about within the hollow gall. Its mouth is large and set well up in the face, and the upper lip has a beak-like curve.

On the 10th of July, 1891, I witnessed the cleaning out of a chrysalis case of *G. gallæ-diplopappi* by a grub of this species. The creature, having finished its meal, left the case and immediately proceeded to spin its cocoon. When completed, this cocoon was long and sack-like, but compact in texture. It was white at first, but it darkened with age. The perfect insect burst from it on the 10th of June of the following year.

On another occasion, on opening a gall, I found a grub of the species just finishing a dessert of the very case of its victim. In this instance the grub, in a short time, voided the indigestible parts of its meal in dark pellets, and then commenced to spin.

I opened a cocoon of the parasite on the 25th of March last, with a view to describing the pupa. I found that the pupal change had not taken place. Preparations for it, however, seemed to be commencing. The head was becoming rounded; the mouth was sealed up, but its outline was still apparent; the pseudopodia were disappearing; the body was becoming attenuated.

I put the creature back into its ruptured envelope, but it was not content to remain in it—it wriggled out, so I placed it in a clean paper box, and, I am glad to say, its changes went on as if nothing unusual had happened.

By the 1st of April the head, thorax and abdomen of the insect could be traced under the skin. The first two had become yellowish, and the eyes, which I had first noticed as faint streaks, now showed as brownish oblong patches.

In the night of April 1-2 the pupal change took place. In the morning I found the shrivelled larva skin still clinging to the extremity of the body. The main parts were now of distinct form, and the antennæ and limbs appeared in proper shape, extended beneath the insect, and beautifully white and pellucid. The only colouring was in the eyes, which were large and brown.

On April 6th I found that the ocelli were distinctly seen, and that the upper part of the abdomen was beginning to darken.

On the 8th the thorax began to turn black. On this date I made a drawing of the pupa. The insect seemed to object to the strong light in which I had placed it. I noticed twitchings of the legs and antennæ. I therefore put it back in its box as soon as possible.

On the 9th I found that the head and thorax were quite black, while the legs and antennæ were still pellucid.

On the 11th the red of the three first segments of the abdomen on the upper side and the black of the remaining segments on the upper side were seen. The upper portions of the legs also and the bases of the antennæ were taking colour.

On the 13th the insect was fully coloured, with the exception of a white streak on either side of the abdomen. The legs had begun to spread themselves.

In the night of the 13th the wings burst from their cases, and before the close of the day following the insect had risen upon its feet.

No doubt the warmth of my house, and the rupturing of the cocoon, hastened the changes of the insect. I should say the usual time of the creature's appearance in the perfect state is the middle of June. The galls formed by the Gelechian begin to show themselves in the first week of June, and there is only one brood of *G. gallæ-diplopappi* in the year.*

Descriptions of the imago, male and female, of *T. tunicula-rubra*:—

♀.—Expanse of wings, one-half inch; length of body, one-quarter inch; length of antenna, two-tenths inch; length of ovipositor, one-tenth inch.

HEAD black, punctured, and set with whitish hairs; face convex; clypeus somewhat nasiform, hairy; compound eyes of a rich madder-brown; ocelli black and prominent; palpi long, five-jointed, flavescent; antennæ filiform, basal joint oblong-ovate, black and hairy. In the flagellum, which is brown, are thirty-one joints, of which the first, counting from the ring-joint, is four times longer than thick.

THORAX black, shining, deeply punctured; mesothorax and scutellum convex; legs long and slender, the coxæ black, trochanters and femora fuliginous, tibiæ and tarsi ferruginous; wings iridescent, slightly hairy; costal and externo-medial nervures hairy; stigma large and brown; areolet rather large, pentagonal; cubito-discal cell large; the third discoidal cell and the first apical cell of moderate size; the second apical cell large; the basal nervures slightly and regularly curved.

ABDOMEN fusiform; petiole rather long and slender, recurved, jet black; the three first abdominal segments deep red, the remainder black; ovipositor ferruginous, straight, stiff and pointed—its case fuscous, blunt and hairy.

♂.—General appearance darker and less robust than that of the female. Antennæ dark brown, nearly black, twenty-six joints in the flagellum, the first being five times as long as thick; eyes prominent, brown; ocelli black; palpi five-jointed, brown; coxæ black, hairy and punctured—the hindmost pair unusually large; first pair of legs ferruginous; the rest fuliginous, with knees of lighter colour; tibial spurs stout; wings smoky; abdomen long and slender; petiole black, extended, horn-shaped; three following segments red, the first and third edged with black; the rest of the abdomen black.

* Wherever I have found *T. tunicula-rubra* I have found the skin over the opening of the gall ruptured, I suppose by the ovipositor of the mother Trychosis.

THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XVI. THE CHRYSOMELIDÆ OF ONTARIO AND QUEBEC—(*Continued*).

TRIBE IV.—CLYTHRINI.

The species included here are of rather short, cylindrical form, sometimes suggesting in shape the *Cryptocephalini*, though easily separated, so far as our genera are concerned, by the shorter and stouter antennæ. Most of them are Southern or Western in distribution, and the few genera recorded from within our limits may be known among themselves by these characters :—

A. Front coxæ contiguous.

Large ; colour, in our species, chiefly yellowish or testaceous ; tarsal claws simple.....*Anomæa*.

Small ; colour in our species bluish, with four yellowish or reddish elytral spots*Babia*.

AA. Front coxæ separated by the prosternum.

Large ; eyes transverse, emarginate.....*Megalostomis*.

Small ; eyes oval, not emarginate*Coscinoptera*.

It seems certain that *Megalostomis* cannot be retained as a member of the Canadian fauna, as the species included therein have never been found farther north than Kansas.

ANOMÆA, Lac.

Represented by *Anomæa laticlavata*, Forst., found occasionally on the rag-weed (*Ambrosia*). It is apparently, however, quite a general feeder, having been taken also on various legumes, and on oak, cotton, and willow. In colour it is fulvous, elytra a little lighter, their sutural and outer margins narrowly bordered with black ; under side of body, excepting the prothorax, dark, but densely covered with light pubescence. Legs yellow, often with tibiæ and tarsi more or less blackish. The male has more deeply serrate antennæ and longer anterior tibiæ than the female. Length, .28-.32 in. Form cylindrical.

COSCINOPTERA, Lac.

C. dominicana, Fabr.—Black ; of robust form, much less elongate than *Anomæa*. The upper surface is sparingly covered with a light-coloured pubescence, the under side much more densely so. Thorax densely, not very coarsely, punctured and with median smooth line.

Elytra more coarsely but less densely punctured. Length, .20-.22 in. The only Canadian specimen I have seen was sent me from Toronto by Mr. R. J. Crew. Fig. 13 [after Riley] represents this insect in all its stages: *a*, the larva extracted from its case; *b*, larva dragging its case, which is composed of chewed fragments of leaves; *c*, beetle, enlarged to show punctures; *d*, beetle, natural size; *e*, egg, highly magnified; *f*, head of larva, under side; *g*, head of male beetle; *h*, jaw of same; *i*, eggs, natural size, showing mode of attachment to leaves; *j*, leg of larva; *k*, jaw of same; *l*, maxilla of same.



Fig. 13.

MEGALOSTOMIS, Chevr.

A record of *M. subfasciata*, Lec., occurs in the supplement to the Label List of Coleoptera for 1889. It is a rather large insect (.24-.30 in.), nearly black, with cinereous pubescence. The elytra each have a large basal red spot reaching from the immediate vicinity of the outer margin to the neighbourhood of the suture. The size and coloration will separate it from any of the known Northern Clythrini. The recognized range is from Arizona to Kansas.

BABIA, Chevr.

A pretty, shining black insect of somewhat oblong form, shining surface, the elytra with a humeral and subapical red spot on each, the anterior the larger. The striae are coarsely punctate. Antennae short, the last character serving to separate it easily from some of the black and red *Cryptocephali* with which beginners occasionally mix it. The species is *B. quadriguttata*, Oliv. Length, .14-.16 in.

TRIBE V.—CHLAMYDINI.

These curious little insects can be mistaken for nothing else. They are of very short, compact form, the upper surface of the body covered with large tubercles; in colour they range from dull brown to black or bronze. The legs are contractile, the antennae short. As has often been remarked, they resemble the excrements of caterpillars, and so closely as

to render their detection, even when swept into the net, a matter of some uncertainty. The two genera are thus distinguished:—

Antennæ serrate from the sixth joint.....*Exema*.

Antennal serrations beginning before the sixth joint.....*Chlamys*.

EXEMA, Lac.

A small black, rough beetle, about .10 in. long, often variegated with very small yellow spots or even with the head and prothorax almost entirely yellow. The legs are usually more or less yellow, the antennæ entirely so. The Canadian *E. dispar*, Lac., is considered a variety of *E. conspersa*, Mann.

CHLAMYS, Knoch.

Represented by *C. plicata*, Fabr., a larger insect than the preceding, and of shorter, more robust form. The tuberosities of the upper surface are very pronounced, the colour more or less metallic brown or black, legs black. The variety *polycocca* is that in which the tubercles are more distinctly separated and not aggregated into the form of ridges as in typical *plicata*. Length, .16 in. Fig. 14 represents the larva (*a*) and its curious sack.



FIG. 14.

TRIBE VI.—CRYPTOCEPHALINI.

Form robust, more or less cylindrical, and sometimes even approaching globularity. Elytra rather short, leaving the tip of the abdomen exposed, not tuberculate, striato-punctate. Antennæ usually long and slender. Colours usually arranged in a variegated pattern, taking on various combinations of spots or stripes, which are sometimes very inconstant; occasionally a species is found which is unicolorous. The genera are thus separated in the "Classification":—

A. Claws appendiculate (*i. e.*, with a square dilatation at base; small species).

Form robust, rounded.....*Monachus*.

Form more elongate, cylindrical.....*Diachus*.

AA. Claws simple (mostly larger species).

b. Prothorax not margined at base, crenulate.

Frontedge of prothoracic flanks sinuous or toothed. *Bassareus*.

Front edge of prothoracic flanks straight... *Cryptocephalus*.

bb. Prothorax margined at base, not crenulate; prosternum feebly channelled.....*Pachybrachys*.

MONACHUS, Chevr.

Two very robust species of blue colour belong here; they may be obtained by sweeping meadows. Dr. Leconte separates them thus:—

Form oval; prothorax smooth, opaque, rows of elytral punctures feeble.....*ater*, Hald.

Form ovate; prothorax with punctures near the base, rows of elytral punctures strong.....*saponatus*, Fabr.

Both are of about the same size (.10-.12 in.) and have rather elongate antennæ, which are testaceous at base.

DIACHUS, Lec.

Contains the smallest Canadian *Cryptocephalini*. They are of cylindrical-oval form, and somewhat metallic colours, overlaid on blue or green. The two recorded from within our limits are:—

Elytral striæ obliterated behind the middle; sides of prothorax, antennæ and legs testaceous; .06-.08 in.*auratus*, Fabr.

Outer elytral striæ impressed, curving around at tip; prothorax smooth; colour, dark blue-green, antennæ and legs reddish-brown; .08-.11 in.*catarius*, Suffr.

BASSAREUS, Hald.

The two species look much like *Cryptocephalus*, but may be distinguished by the character given in the table. *B. detritus* measures from .18-.22 in., and is of a blackish colour, the elytra with four red spots; the prothorax is opaque, sparsely punctured. The other species, *B. mammifer*, has a smooth, shining prothorax, and varies from .14-.22 in. in length. The typical form has elytra spotted like those of *detritus*; *i. e.*, a large anterior spot on each wing-cover and an apical one. It runs, however, through the following varieties, which have received separate names: *sellatus*, Suffr., in which the anterior elytral spot is reduced in size and the sides of the prothorax are white; *pretiosus*, Melsh., with a larger anterior elytral spot, which is connected with some small basal spots, the prothorax with sides and two spots at base white; and *luteipennis*, Melsh., with yellow elytra.

CRYPTOCEPHALUS, Geoffr.

A number of species occur in Canada, some of which will be found mixed, in the collections of beginners, with *Babia 4-guttata* and the species of *Bassareus*. They are, however, readily separated when once attention has been called to the characters in use for the purpose. The

following table will, it is thought, serve for the separation of the Canadian forms among themselves without reference to prosternal characters, for an exposition of which the student is referred to Dr. Leconte's paper on the genus in Trans. Amer. Ento. Soc. for 1880.

- A. Elytra yellow with two oblique black stripes ;
prothorax reddish, usually with two basal
oblique yellow spots. .17-.21 in. (Fig.
15)..... *Venustus*, Fabr.

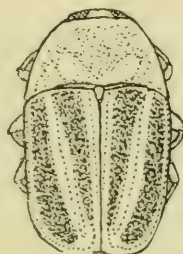


FIG. 15.

AA. Elytra spotted.

- b¹. Spots numerous, arranged 2, 2, 2, 1 on each
elytron, yellowish on brown or black
ground. Prothorax reddish. .16-.22
in..... *guttulatus*, Oliv.

- b². Spots at base confluent into a transverse band which extends to
the sixth stria, a marginal spot just before the middle extend-
ing to fifth stria, an interrupted post-median band and apical
spot, all yellow. Ground colour of elytra brown. Pro-
thorax brown. .12-.16 in..... *badius*, Suffr.

- b³. Spots very different in size, the middle ones usually confluent,
into a large blotch on the sutural region, the others usually
quite small and arranged in longitudinal rows; they are
brown or black on a pale yellow ground. The prothorax is
ferruginous or nearly black; sides and front, and often also
two oblique basal spots, yellow. .16-.28 in. *mutabilis*, Melsh.

- b⁴. Spots red, not exceeding two on each elytron; ground colour
black or blue-black, prothorax black.

- c. Humeral spots confluent on median line so as to form a band
extending quite across (var. of next species). *notatus*, Fabr.

cc. Humeral spots separate.

Larger and more robust; humeral spot large, extending
along sides, apical spot variable in size. .14-.22
in..... *quadrinaculatus*, Say.

Smaller and more slender; humeral spot oblong, slightly
wider behind, hardly reaching the base. Apical spot
rounded. (The var. *4-guttulus* differs only in having
the humeral spot longer, reaching to the middle of the
length of the elytra.) .10-.12 in. *quadruplex*, Newm.

AAA. Elytra plain. Colour testaceous or slightly brownish; prothorax densely rugosely punctured. .12-.16 in. *Schreibersi*, Suffr.

It should be remarked that nearly all of these are very variable in colour, but the table covers all of the recorded named varieties for East Canada. Any specimens which appear not to come under any of the names given should be referred to specialists.

PACHYBRACHYS, Chev.

Contains a number of small species in which the outer striæ of the elytra are usually completely confused and the inner ones tortuous and irregular. They have been tabulated by Dr. Leconte, in the paper cited, and in this as well as the preceding table we have drawn upon his work for many characters.

A. Colours of upper surface definitely arranged.

b¹. Striped yellow and black or brown.

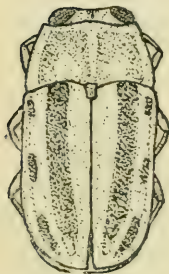


FIG. 16.

Suture broadly black, each elytron with two broad stripes and narrow margin black. Thorax with M-like brown mark. .10-.14 in. *litigiosus*, Suffr.

Suture very narrowly black, each elytron with a broad oblique stripe, narrow outer margin and an intervening row of spots black. Thorax either entirely yellow, ferruginous, or yellow with ferruginous, M-like mark. .14-.22 in.

(Fig. 16)... .. *viduatus*, Fabr.

b². Opaque black, prothorax with sides, front margin, anterior portion of median line and two basal spots, red. This red may be variously reduced. .16-.20 in. *trinotatus*, Melsh.

b³. Yellow above, head with black spot on crown, prothorax with a black spot on each side, and a somewhat Y-shaped one at middle. Elytra with humeral spot and a large V on suture, which joins at its apex with an irregularly indented transverse subapical band, black or brown. These markings may become indistinct at times. .06-.12 in. *tridens*, Melsh.

AA. Uniform opaque black. .10-.14 in. *carbonarius*, Hald.

AAA. Colours more or less mottled.

c. Sides of prothorax strongly rounded and incurved near base; hind angles rounded.

Black, mostly opaque, upper surface mottled with small white dots; prothorax sometimes red at sides, femora often with a yellow spot. Elytra confusedly coarsely punctured over most of the surface. .13-

.16 in.....*luridus*, Fabr.

Black, opaque, elytra with fewer confused punctures, white spots more numerous; pygidium with testaceous spots, legs testaceous in great part.

.10 in.....*femoratus*, Oliv.

cc. Sides of prothorax obliquely broadly rounded or straight, not incurved behind.

Punctures of prothorax and elytra uniform, two striae visible at sides; upper surface dull ochreous clouded with brown. .08-.12 in.....*hepaticus*, Melsh.

Punctures of elytra more or less irregular, striae visible at sides and behind. Black, opaque, prothorax with sides and dorsal spots red, elytra with a broad irregular band from the side almost to the suture.

.11-.14 in.....*subfasciatus*, Hald.

The above scheme includes all of the species known from East Canada which are included in Dr. Leconte's table, which has been followed for the most part. Three recorded forms, *atomarius*, *infaustus*, and *sobrinus*, are left unaccounted for; they belong to a group of small species, mostly mottled, in which the prothorax is formed as in the division cc, the elytral sculpture consisting usually of an irregular puncturation, with the striae visible chiefly at sides and behind. The prosternum is broad and only very slightly concave, which character will separate them from the species preceding *hepaticus*, since the prosternum in all those is sulcate. A careful study is required, with reference to the types, before anything further should be attempted.

WE have much pleasure in recording that the Honorary Degree of LL.D. was conferred upon two members of the Entomological Society of Ontario — Professor WILLIAM SAUNDERS, F. R. S. C., F. L. S., F. C. S., Director of the Experimental Farms of the Dominion, and Mr. JAMES FLETCHER, F. R. S. C., F. L. S., Dominion Entomologist and Botanist,— at the recent convocation of Queen's University, Kingston, Ontario. We beg to offer our esteemed friends our very hearty congratulations upon this well-deserved honour.

FIVE NEW BEES OF THE GENUS *CALLIOPSIS*, FROM NEW MEXICO.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Calliopsis meliloti, n. sp., ♀.—Length, 5 mm.; head and thorax wholly black, abdomen very dark brown, with yellowish-white markings. Head, thorax, legs, and sides of abdomen with abundant long dull white hair. Clypeus prominent, shining, with conspicuous sparse punctures, its upper portion longitudinally sulcate in the middle, its whole surface appearing bare, with only very short, inconspicuous hairs. On each side of the clypeus is a shining bare eminence. Vertex closely punctured. Mandibles brown. Antennæ quite short, the hairy scape not much less than half as long as the flagellum, the last joint of which is truncate and somewhat flattened.

Tegulæ shining testaceous. Dorsum of metathorax bare, smooth. Legs dark, knees and terminal joints of tarsi becoming paler. Wings quite short, hyaline, iridescent, nervures and stigma light reddish-brown. Second submarginal cell about three-fourths length of 1st; narrowed one-half to marginal. Abdomen short and broad, with broad creamy-white bands; that on first segment narrowly interrupted in middle, and roundly notched on each side behind; that on second very broadly interrupted, and also notched at sides; those on third and fourth entire, notched at sides behind; finally an obscure broad subrufescent band partly on fourth and partly on fifth segment. Anal fimbria dirty white.

Habitat.—Las Cruces, N. M., on the College Farm, May 1st, 1895; swept from *Melilotus indica*, together with *Nomada*, *Sphecodes*, *Prosapis*, and four species of *Halictus*, viz.: *bardus*, *stultus*, *pectoraloides*, and *meliloti*.

It is related to *C. cinctus*, Cr., but differs in the abdominal bands being white instead of yellow. The anal fimbria not fuscous, the wings not at all dusky. It has some superficial resemblance to *Perdita albobittata*.

Calliopsis hirsutifrons, n. sp., ♂.—Length about 6 mm.; pitch-black, very shiny, thorax and abdomen without any pale markings, face-markings creamy-white. Face, including clypeus, scape, cheeks, occiput, sides of thorax, post-scutellum, metathorax except basal middle, legs, and lateral hind margins of abdominal segments, with rather dense and fairly long white pubescence. Head transversely oval, ocelli small and close together, vertex with no distinct punctures; clypeus except the usual

dots, and triangular lateral face-marks, white, the latter in shape not very far from a half-circle, but the ends more produced and the inner (orbital) margin a little concave. Mandibles mostly white without. Flagellum black above, coffee-brown beneath.

Disc of mesothorax with conspicuous, very sparse punctures; at sides of mesothorax, and on scutellum, they are much closer. Tegulæ dark chestnut-brown. Legs black, anterior tibiæ in front, and first joint of all the tarsi, cream colour; remaining joints of tarsi subrufescent. Claws deeply cleft. Wings hyaline, with a faint smoky tinge, which does not extend to the external margin; nervures and stigma dark brown, marginal cell long, the tip roundly truncate, minutely appendiculate. Second submarginal a little shorter than 1st, narrowed a little less than one-half to marginal. Abdomen narrow, strongly but rather sparsely punctured, the segments transversely grooved adjacent to the sutures. Hind lateral margins of segments with white hair bands.

Habitat.—Albuquerque, N. M., middle of August, 1895 [Ckll., 4527]. Something like *C. pauper*, but hairy, and the tibiæ are differently marked. It resembles a good deal the ♂ of *C. albitarsis*, which I took on *Rudbeckia laciniata*, at Santa Fé, N. M., July 19th. In *albitarsis*, however, the face is not nearly so hairy, the face-marks are pale yellow, and the lateral marks are obtuse instead of pointed above.

Calliopsis fraterculus, n. sp., ♂.—Length about $6\frac{1}{2}$ mm., pitch-black, with the clypeus, triangular marks at sides of face, and tibiæ in part, pale lemon-yellow, tarsi light. Head broader than long, shining, the ocelli in pits, a conspicuous prominence adjacent to the summit of each eye, occiput and cheeks with large, more or less confluent, punctures. Vertex with very few punctures, front with large subconfluent punctures; clypeus punctured, high, light yellow, with its piceous apical margin produced into a tooth on each side; lateral face-marks triangular, rounded above, not extending as high as antennal sockets; labrum truncate, mandibles wholly dark; antennæ short, reaching about to tegulæ, flagellum dark brown. Thorax wholly dark, with large punctures; pubescence of head and thorax sparse and inconspicuous, white, specially noticeable only on each side of antennæ, on border of prothorax, beneath the wings, and at the sides of the metathorax. Punctures of scutellum and post-scutellum very large and like those of mesothorax, those of metathorax smaller and closer. Base of metathorax with obscure longitudinal wrinkles, but no well-defined smooth space behind them. Tegulæ shining dark reddish-

brown. Wings fuliginous, nervures and stigma piceous, a pale dot at base of stigma. A small hyaline spot at angle between marginal and second submarginal cell, and one just beyond upper corner of third discoidal. Venation practically as in *æthiops*, but the marginal cell not so narrow in proportion to its length. Legs black, knees and external bases (half, more or less) of tibiæ pale yellow, tarsi pale yellow, the terminal joints becoming brown. Claws only slightly bifid. Abdomen densely punctured, the apical margins of the segments smooth and constricted. ♀.—Length about 7 mm., more robust, abdomen broader, segments not constricted, punctuation in general finer, legs with dirty white hairs, dense on hind pair. Legs dark, with a light yellow spot at extreme base of each of the anterior and middle tibiæ. Face wholly dark.

Habitat.—New Mexico; the ♀ on *Bigelovia Wrightii*, at Las Cruces, Sept. 23rd, 1895; the ♂ at Albuquerque, middle of August, 1895.

This species is a sort of small brother of *C. æthiops* (Cr.), from which it is easily distinguished not only by its size, but by the sculpturing of the metathorax. *C. æthiops*, also, does not have the shining boss at the summit of the eyes, which is present in both sexes of *fraterculus*. I have taken *C. æthiops* at Las Cruces, N.M., Sept. 21, 1895, on *Helianthus annuus*.

Calliopsis perlævis, n. sp., ♀.—Length, 8 mm., black, shining; face and thorax without pale markings. Head subquadrate, not particularly large, a little longer than broad; clypeus rather prominent, produced into a tooth on each side; mandibles dark reddish at ends; face, clypeus, front, vertex and cheeks strongly punctured, the punctures smallest and most dense on front and beneath antennæ; antennæ reaching as far as base of wings, joints 6 to 10 of flagellum testaceous beneath. Mesothorax shining, with small shallow punctures, fairly dense in front and at sides, but becoming sparse towards the middle, and almost lacking in the middle. Scutellum with sparse punctures, base of metathorax longitudinally wrinkled. Pubescence of head and thorax sparse, very pale brownish, most noticeable on cheeks, occiput and pleura; only a few scattered hairs on sides of metathorax. Tegulæ amber colour. Wings subhyaline, grayish, yellowish towards the base, costal nervure and stigma dark brown. The outermost nervures also dark brown, but the rest amber colour. Second submarginal a little shorter than first, narrowed about half to marginal. Legs dark, a rather ill-defined small yellow spot at base of each of the four anterior tibiæ, tarsi becoming rufescent. Hind legs with a copious clothing of hair. Abdomen shining, parallel-sided, the apical

margins of segments 2 and 3 becoming rufescent. Punctures of dorsum minute and close, on first segment extremely sparse and small.

Habitat.—Las Cruces, New Mexico; two on sunflowers, October 6th, 1895. By its smooth surface it comes nearest to *C. margaritensis*, Fox, but that is a smaller insect.

Calliopsis Boylei, n. sp., ♂.—Length a little over 7 mm., very slender, black with yellow markings. Head somewhat broader than long; antennæ very long, entirely black; face flattened, the clypeus not projecting; entirely bright lemon-yellow nearly up to the level of the antennæ, the upper edge of the yellow straight right across the face, the yellow projecting above this only for a short distance, very narrowly, on orbital margins. The supraclypeal yellow area is about square. The labrum is also yellow, as well as part of the mandibles without. There is an impressed line down the middle of the clypeus, failing anteriorly. Face with large scattered punctures, almost lacking on supraclypeal area and close to the impressed line of clypeus: front, vertex and cheeks closely punctured. Pubescence of head and thorax sparse, tinged yellowish; anterior sides of clypeus with long white, very distinctly plumose hairs. Mesothorax shining, with distinct, rather close punctures, parapsidal grooves distinct. Scutellum with large, not very close, punctures. Base of metathorax transversely wrinkled, the area behind this not smooth, but minutely roughened. Sides of metathorax fringed with hairs. Tubercles with a chrome-yellow spot, tegulæ shining testaceous. Wings yellowish-hyaline, nervures and stigma dark chestnut-brown, costal nervures black, marginal cell unusually long, 2nd submarginal narrowed one-half to marginal. Legs black, with the knees, the anterior tibiæ in front, a spot at base and apex of middle tibiæ, nearly the basal third and the apical eighth of hind tibiæ, pale orange. Tarsi pale orange, the terminal joints darkened. Claws long and curved, only cleft at extreme tips. The hind legs are very long; the middle tibiæ are very short, hardly half as long as the hind tibiæ. Abdomen long and slender, black, the bases of the segments after the first with a fine light pile, very noticeable when the insect is held sideways. Dorsal surface of abdomen, except the broad impressed apical margins of the segments, finely and closely punctured, the punctures extremely small and close, except on the first segment.

Habitat.—Santa Fé, New Mexico; Aug. 2nd, 1895; given to me by V. Boyle, with the statement that it was caught on *Cleome serrulata*.

By its face-markings this resembles *C. compositarum*, Rob., but it differs at once from that in its less densely punctured mesothorax, and the longer marginal cell.

NEW HAMPSHIRE HESPERIDÆ.

BY W. F. FISKE, MAST YARD, N. H.

All of the following species occur in the town of Webster, about ten miles north-west of Concord :—

Carterocephalus Mandan, Edw.—This is one of the rarest species in this section. It occurs in but one locality—a grassy bank by the roadside. Middle of June.

Ancyloxypha Numitor, Fab.—Common around very wet, grassy swamps in June and again in August.

Pamphila Hobomok, Harris.—One of the most common ; the third *Pamphila* to make its appearance in the spring, usually about the first of June. Very general in its habit, frequenting both wet and dry land, but preferring a moist, bushy pasture, with plenty of bramble blossoms.

Var. *Pocohontas*, Scud.—Appears about a week later than *Hobomok*. Rather scarce.

Pamphila Sassacus, Harris.—The second *Pamphila* to make its appearance in the spring, about a week before *Hobomok*. Common.

Pamphila Metea, Scud.—The earliest *Pamphila*, appearing about May 15th. It frequents very dry, sandy land, where little vegetation exists, except “bunch grass” and sweet fern. The former—scientific name unknown, but variously known as “bunch grass,” “wolf grass,” “hassock grass”—is very probably the food plant. Owing to its early appearance and peculiar haunts, it long escaped the notice of previous collectors in this section. One brood only observed.

Pamphila Leonardus, Harris.—The last butterfly to emerge as a first brood. Somewhat common in clover fields last of August and first of September, but rather hard to capture in good condition. With exception of *Cernes*, it is the most difficult *Pamphila* to approach when not feeding.

Pamphila Otho, var. *Egeremet*, Scud.—Rather scarce, frequenting moist roadsides and bushy pastures. First specimen appearing about July 10th. I have a curious specimen (a ♀), probably a variation of this species, in which the spots on both sides of the primaries are larger and more sharply defined, and there is a row of four or five faint spots on the upper side of the secondaries. The clouded band or row of spots on the under side of the secondaries is condensed into a row of distinct small spots, giving it a very different general appearance.

Pamphila Peckius, Kirby.—One of the most common, about equally common with *Cernes*, *Metacomet*, and *Hobomok*. Three broods: it accompanies *Mystic* in June, *Metacomet* in July, and *Leonardus* in August and September. A few specimens on the wing as late as October, which may be fragments of a fourth brood. There is a rather scarce form in which the yellow spot on the under side of the secondaries is divided quite in two, and another form in which the spots on the upper side of the secondaries are missing, giving the male—were it not for the stigma—a very close resemblance to *Cernes* on the upper side.

Pamphila Mystic, Scud.—The most common. Appears about June 5th and again, though very rarely, about September 1st. The male varies considerably; in many cases, when superficially observed, closely resembling *Sassacus*.

Pamphila Cernes, Edw.—Common; appearing about June 15th and again, though rarely, in August. There are probably more variations in this species than in any other native one. One of the most odd is a female in which the subapical spots are entirely wanting and the others are very much reduced in size.

Pamphila Manataaqua, Scud.—Rather rare. July 10th to August. All the males yet taken have had a row of four or five indistinct spots on the upper side of the secondaries, but not always on the under side. As is the rule with most species of butterflies, the males appear some time before the females.

Pamphila Metacomet, Harris.—Common; about June 20th or 25th to middle of July. Female varies much in the number and size of the white spots. I have seen specimens of *Cernes*, *Metacomet*, and *Bimacula* (with the white fringe worn off) which it would be almost impossible to tell apart without examining the under sides. I once observed a very ardent courtship carried on by a male *Peckius* towards a female *Metacomet*. The female, however, seemed to be a little disgusted with her admirer, and kept flying about from point to point. The *Peckius* followed her, however, until an unintentional movement on my part frightened it away.

Speaking of inter-special matings, a person who, though not an entomologist, has observed butterflies a good deal, and helped me not a little, solemnly affirmed that he had seen an *Argynnis Idalia* in coitu with *Phyciodes*, sp. This is "coming it a little too strong."

Pamphila Bimacula, G. and R.—Somewhat common in very wet meadows, in June and July. The ♀'s are apparently much in excess,

contrary to the general rule. It flies with a long, straight flight peculiar to this species, dropping suddenly into the grass, and hard to observe unless flushed, owing to its colour being so like the stubble. Because of its peculiar habits it might, like *Pam. Metea*, pass as a great rarity. It has frequently been observed by me feeding on the flowers of *Arethusa*, a very fragrant orchid growing in wet meadows among the grass, and later in the season on swamp milkweed.

Pamphila Delaware, Edw.—One specimen only. July 10th, 1894. Wet meadow.

Amblyscirtes Vialis, Edw.—Somewhat common. May and June.

Amblyscirtes Samoset, Scud.—Not nearly as common as *Vialis*, and not on the wing so early.

Nisoniades Brizo, Bd.—Lec.—Scarce. Early June.

Nisoniades Icelus, Lint.—Common. May, June. It is very possible, as I have given this species very little study, that there may be another species in company with it. According to Scudder, *Lucilius* should be found here.

Nisoniades Persius, Scud.—Scarce in July and August. Probably a second brood, but as it would be difficult to distinguish from *Icelus* on the wing, the first brood might easily escape notice.

Nisoniades Juvenalis, Fabr.—Somewhat common in June.

Eudamus Pylades, Scud.—Very common in June.

Eudamus Bathyllus, Sm. and Abb.—While looking over a series of native *Pylades* this winter my attention was struck by the appearance of a specimen which Mr. Skinner pronounces to be *Bathyllus*. I remember nothing about the capture of the specimen, and never having looked for the species, or expected to meet with it so far north, I can say nothing as to its habits or numbers.

Eudamus Tityrus, Fabr.—Formerly scarce, but of late years common. The last season it was as common as *Pylades*. I have frequently noticed the female hovering over patches of wild bean (*Phareolus perennis*), but not until last season did I find larvæ on this plant. Out of several such larvæ one *Tityrus* emerged this winter from a forced pupa. I have also seen larvæ on garden beans, which were probably this species.

There are several more species of *Hesperidae* which ought to be found in this locality, but the preceding are all that I have met with. If the season of 1896 is a good one, I hope ere it closes to add something to the knowledge of this family.

ON TWO INTERESTING NEW GENERA OF SCALE INSECT PARASITES.

BY L. O. HOWARD, WASHINGTON, D. C.

Nearly all the Chalcidid parasites of Coccidæ belong to the sub-families Aphelininæ and Encyrtinæ. So universal is this rule that it is remarkable to rear anything else from a Coccid (excluding, of course, hyperparasites)*. One or two Mymarids and the species of the curious subfamily Signiphorinæ live in the eggs of scale insects, and we are just beginning to realize that there is a peculiar group of genera allied to the old subfamily Pireninæ which also have this habit.

The first of these insects to be recognized as a primary scale insect parasite was a species of the genus *Tomocera* described by the writer in 1880 and reared from *Lecanium oleæ* from California. This name in 1885 was changed to *Dilophogaster* on account of the occurrence in Thysanura of a genus *Tomocerus*. In the meantime, however, Cameron had erected for the same form, from specimens received from the Hawaiian Islands, his genus *Moranilla*. According to the present rules of classification, however, *Tomocera* may stand in spite of its identical etymological significance with *Tomocerus*.

Another of these genera was described by Dr. Riley in 1890 as *Ophelosia* from specimens reared from *Icerya purchasi* in Queensland. A third—Walker's genus *Eunotus*—has recently been found by Mr. W. G. Johnson to be parasitic upon *Lecanium* scales in Illinois, as pointed out by the writer in Technical Bulletin No. 1, Division of Entomology, U. S. Department of Agriculture, and a fourth—*Scutellista*, Mots.—has been found by Dr. Berlese to parasitize *Ceroplastes* scales in Italy. This form has been redescribed with synonymical notes by the writer in the "Revista di Patologia Vegetale."

Aside from the matter of tibial armature, these genera seem closely allied and to possess on the whole strong mutual affinities. The shape of the head, its acute occipital margin, the mesonotal characters, the 10-jointed (♀) and 9-jointed (♂) antennæ, the greatly enlarged second segment of the abdomen, together with other characters point to a subfamily not yet recognized in our classification of the Chalcididæ, and the uniform Coccid-feeding habit binds the group still more closely together.

* Representatives of *Pachyneuron*, *Euneura*, and *Hypsicamara* have been reared from Coccidæ, but those of *Pachyneuron* are almost certainly hyperparasites, and the others may be; while the species of *Tetrastichus* quite commonly so reared are undoubtedly secondary.

In view of these facts, the receipt of two additional allied genera, also Coccid-feeders, and undescribed, from Mr. W. Maskell, of New Zealand, becomes a matter of considerable interest.

APHOBETUS, n. g.

Female.—Antennæ 10-jointed, clavate, inserted just above clypeus, scape slender, not reaching to middle ocellus, pedicel long, three times as long as first funicle joint, funicle joints 2 to 5 increasing slightly in length and considerably in width, club ovate, slightly broader than funicle joint 5 and longer than 4 and 5 together. Eyes naked; parapsidal sutures meeting axillar sutures; scutellum broad at base, with a distinct transverse groove at apical third. Petiole broad, distinct, abdomen without the white basal tufts characteristic of *Tomocera*, second segment very long, three times as long as remaining segments together. Marginal vein of fore wings somewhat longer than stigmal, postmarginal evident, but shorter than stigmal; basal nervure distinct. Hind wings broad and furnished with a strong basal vein running nearly at right angles into disc of wing for some little distance at extremity of submarginal. Hind coxæ somewhat swollen, middle tibiæ with a moderate spur, hind tibiæ with a very long spur, a little longer than first tarsal joint.

Male.—Differs mainly in antennæ, which are 9-jointed; scape longer than in the female, pedicel somewhat swollen, joints 1 to 4 of funicle with long hairs, strongly incised from above at extremities and each joint slightly pedicellate; joint 1 longest, twice as long as pedicel, joints 2, 3 and 4 each becoming shorter, club somewhat ovate, with its first joint distinctly separated and as a whole longer than funicle joint 4, but shorter than 3 and 4 together. Body flat, abdomen somewhat elongate, second segment somewhat longer than remaining joints together.

Aphobetus Maskelli, n sp.

Female.—Length, 1.16 mm.; expanse, 2.4 mm.; greatest width of fore wings, .51 mm. General colour blue-black, slightly metallic, glistening. Face with faint shallow, sparse depressions; mesoscutum delicately shagreened, abdomen smooth, shining, hairs of mesonotum black, fimbria of metanotum rather sparse, grayish; pleura shining; antennæ honey-yellow, with pedicel and scape above darker; all coxæ and femora black, the latter yellowish at tip; all tibiæ dark in middle, yellowish at either end; wing veins dark brown, except basal vein of fore wings, which is lighter; fore wings with circular fuscous patch occupying centre of wing.

Male.—Somewhat slenderer than female, but about same length; sculpturing identical, antennæ jet black, legs coloured as with female.

One female, four males, reared by W. M. Maskell, New Zealand, from *Ctenochiton viridis*. This is probably the insect figured by Mr. Maskell on Plate XXIII. of his "Scale Insects of New Zealand," 1887.

ANYSIS, n. g.

Female.—Antennæ as with *Aphobetus*, except that funicle joint 2 is twice as long as 1; 3, 4 and 5 subequal in length, increasing in width, and each slightly shorter than 2. Eyes naked; head very broad; occiput strongly concave, its superior margin acute. Thorax well arched; parapsidal sutures meeting axillar sutures; scutellum broad at base, somewhat lengthened, extending over metanotum to vertical plane of base of abdomen, not cross-furrowed. Petiole distinct but very short; abdomen without basal tufts; second segment scarcely half the length of abdomen. Marginal vein of fore wings three times longer than stigmal, postmarginal about as long as stigmal or slightly shorter; basal nervure not distinct. Basal nervure of hind wings extending at an acute angle toward base of wing. Spur of hind tibia short.

Anysis australiensis, n. sp.

Female.—Length, 1.7 mm.; expanse, 3.8 mm.; greatest width of fore wings, .74 mm. General colour blue-black, slightly metallic, glistening. Head and thorax with short, sparse, yellowish pile; face delicately shagreened and with fine sparse punctures; mesonotum similarly punctured; metanotum, pleura, and abdomen smooth; metanotum with a median longitudinal rounded carina. Antennæ light brown, tip of club darker, pedicel and tip of scape above black; all femora nearly black in middle, lighter at either end; tibiæ brown. Wing veins dark brown, fore wings infuscated, hind wings hyaline.

Three females received from Mr. W. M. Maskell with the following note: "With a very curious new Coccid from West Australia, genus not yet determined; probably allied to *Eriococcus*."

MISS ORMEROD, who was for some years Consulting Entomologist to the Government, her knowledge of the insect world being unapproached by any other living authority, has now received the distinction of being appointed an examiner in this branch of agricultural science at Edinburgh University.—*Illustrated London News*.

CORRESPONDENCE.

THE MUTILLID GENUS CHYPHOTES.

On Aug. 21, 1894, I found at Santa Fé a specimen of *Chyphotes*, which I thought might prove to be a new species, as the legs are brown, with the femora and tibiæ, except their ends, black. The abdomen is also more elongate than in Blake's figures of *C. elevatus*, and the third segment is fuscous. The length of the insect is 9 mm. Mr. Fox, after comparing it with Blake's types, is persuaded that it is only a form of *elevatus*. It follows the rule already observed in certain bees of the genus *Perdita*, that individuals from higher elevations are darker.

The most curious thing developing from the examination of this specimen was, that Blake's account of the palpi of *Chyphotes* is all wrong. My example has the palpi honey-colour, maxillary palpi 6-jointed, lateral palpi 4-jointed. Formula for maxillary palpi 3 (46) (25) 1. Second joint of lateral palpi broadened. When I called Mr. Fox's attention to this, he wrote back that *C. elevatus* was really similar, the description being wrong.

T. D. A. COCKERELL.

PROPOSED BIOLOGICAL STATION.

The undersigned has it in view to found in New Mexico a Biological Station, and health and holiday resort for scientific persons, teachers, and kindred spirits. No loafers would be admitted, nor persons whose health was so poor as to prevent them from working.

Practically no funds are at present available, but it is hoped that if a very modest start is made, the means may in time be found to put the institution on a secure and permanent basis.

In such an establishment, scientific work may be carried on without any fear of interference by politicians and other self-interested or ignorant persons; while the Station might also come to be recognized as an independent educational centre, helping to promote the best interests of education in the broadest sense, as well as those of pure science.

The promoter hopes to be able, sooner or later, to secure the co-operation of a number of persons who will engage in the work for its own sake, and will not object to necessary privations or be afraid of the inevitable difficulties. Without enthusiasm, nothing can be done.

Three years' experience in this country gives the writer the highest opinion of the value of the climate for persons in the earlier stages of

phthisis (as he was himself when he came here); while the abundance of new and interesting forms of life, especially among the insects, is remarkable. Many interesting general problems, such as those of the life-zones, can also be studied in New Mexico to great advantage.

A beginning will be made this summer if students can be found. The undersigned will be glad to hear from any who are interested in the matter, and especially from those who might be inclined to work with him for longer or shorter periods during the present summer.

May 4, 1896.

T. D. A. COCKERELL,
Las Cruces, New Mexico, U. S. A.

A MOTH OUT OF PLACE.

There has been added to the Society's collection a moth of more than ordinary interest. I sent to Prof. J. B. Smith, for determination, a box of specimens which were to me either new or doubtful. He kindly and promptly returned the same with the names of all except one, which was a *Plusia* quite new to him, and retained it for further study. In the letter to me accompanying the names, the Professor remarked: "No. 12 (*Teniocampa vegeta*) is rather a surprise to me from your locality. Of course, it is not a *Teniocampa*, but it has been so described." He then referred me to his catalogue of the Noctuidæ (Bulletin 44, of the U. S. N. M.) for what was known concerning the species. So I turned to it and found this on page 207:

"*T. vegeta*, Morr.

"1875. Morr., Proc. Ac. Nat. Sci., XXVII., 432, *Teniocampa*.

"Habitat.—Texas.

"The type is in the Tepper collection. A correctly named specimen is also in the British Museum, from the Grote collection. The species is not a *Teniocampa*, and probably belongs to the fasciatæ; but in default of sufficient study to place it certainly, I leave it here for the present. Mr. Slingerland has called my attention to the fact that *Cissusa spadix*, of Cramer, heretofore referred as a synonym of *Drasteria erectea*, is a distinct species. On examination I find this to be the fact, and it is more than likely that it will prove the same as the above species. Material for study is lacking, therefore the reference can not be positively made."

So it yet remains inaccurately placed from want of sufficient material for study. It seems also to have got far away from its supposed proper place of residence. Taken in London, at electric light, about the middle of April, 1896.

J. ALSTON MOFFAT.

BOOK NOTICES.

THE TAXONOMIC VALUE OF THE ANTENNÆ OF LEPIDOPTERA. BY DONALDSON BODINE, TRANS. AMERICAN ENTOMOLOGICAL SOCIETY, XXIII., PP. 1-56, PLATES I.-V., 1896.

Mr. Bodine finds good characters in the finer external structure of the antennæ, especially the sculpturing and the distribution of the different types of sensory hairs. Prof. Comstock's suborders are abundantly confirmed. Not only does Mr. Bodine find that the antennæ of *Hepialus* and *Micropteryx* separate them sharply from all the frenatæ, but he considers the jugatæ even more nearly allied to the *Trichoptera* than to the other Lepidoptera. Mr. Bodine does not attempt a rigid classification of the frenatæ on antennal characters which would have been desirable; but draws attention to a number of special affinities. The only one of these which is at all disturbing to the most recent views is that which implies a close relationship between the *Sphingidæ* and *Sesiidæ* (p. 36). In spite of the close similarity in structure of the antennæ, I do not think that this view which derives the *Sphingidæ* from the *Sesiidæ*, and therefore from the Tineids, will obtain. There seem to be too many objections on other grounds. HARRISON G. DYAR.

THE CRAMBIDÆ OF NORTH AMERICA, by C. H. Fernald, A. M., Ph. D., Massachusetts Agricultural College, 1896.

This little book of less than one hundred pages is really an admirable monograph of this family of Grass-moths. In the introduction, the author briefly relates the injury that is often done by these insects to grass crops, and mentions some of the natural enemies that keep them in check. He then gives an historical account of the family in the writings of Entomologists, and after a chapter on the external anatomy, proceeds to give descriptions of the genera and species, including the preparatory stages as far as known. The synoptical tables of genera and species are excellent, and afford a ready means of identifying a specimen when made use of in connection with the clear and concise descriptions and the beautiful illustrations. Besides a few wood-cuts in the text, there are three plates depicting the anatomy and wing venation of the family, and six exquisite coloured plates of the species. We trust that collectors will now be induced to study this family, as the way has been made so easy for them, and then be encouraged to investigate other families of Microlepidoptera.

Mailed June 4th.

The Canadian Entomologist.

VOL XXVIII.

LONDON, JULY, 1896.

No. 7.

THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XVII. THE CHRYSOMELIDÆ OF ONTARIO AND QUEBEC—(*Continued*).

TRIBE VII.—EUMOLPINI.

A large group, containing numerous genera and species ; the North American forms have been recently studied by Dr. Horn, and the following generic table is a condensation, with a few modifications, of the one given by him.

A. Anterior margin of prothorax beneath arcuate, forming post-ocular lobes.

b. Body above pubescent or scaly.

Thorax without distinct lateral margin *Adoxus*.

Thorax with distinct lateral margin, size rather large. *Glyptoscelis*.

bb. Body above glabrous.

c. Small species (not above .16 in.) *Typophorus*.

cc. Larger (above .20 in.)

Claws simply divergent, legs dark *Chrysochus*.

Claws divaricate, legs testaceous *Tymnes*.

AA. Anterior margin of prothorax beneath straight.

d. Thorax without distinct lateral margin.

Not metallic above ; thorax transverse, third antennal joint not longer than the second *Xanthonia*.

Metallic green above *Graphops*.

dd. Thorax margined.

e. Head with distinct supra-orbital grooves, middle and hind tibiæ emarginate near the apex *Metachroma*.

ee. Head without supra-orbital grooves.

f. Lateral margin of prothorax irregular or undulating.

Prosternum narrow, contracted between the coxæ. *Colaspis*.

Prosternum wide, sides nearly parallel. . . . *Rhabdopterus*.

ff. Lateral margin of prothorax regular and entire ; third joint of antennæ distinctly longer than the second, the outer five joints not abruptly wider *Nodonota*.

ADOXUS, Kirby.

Represented by *A. obscurus*, Linn., var. *vitis*, Fabr., a broad-shouldered insect about .20 to .25 in. long; the thorax dark brownish or black and much narrower than the yellowish elytra, which are punctate in rows and clothed with a fine whitish pubescence. Legs dark, tibiae paler. The typical *obscurus* has the elytra dark, unicolorous with the thorax.

GLYPTOSCELIS, Lec.

The only record is of *G. pubescens*, Fabr., a rather large (about .35 in.) insect of somewhat parallel form and green-bronze colour, clothed with a pubescence of mixed cinereous and yellowish hairs. The thorax and elytra are confusedly and distinctly punctured; the neighbourhood of the scutellum has a depressed space. Legs more or less reddish.

TYPOPHORUS, Er.

T. canellus, Fabr., is one of the most variable of our Chrysomelidæ. It is a small insect, not exceeding .16 in. in length; the thorax narrower than the elytra, which are distinctly punctured in rows. Surface shining. In colour there is such a variation as to have given rise to several varietal names, *aterrima*, Oliv., having been applied to an entirely black form. The name *4-notatus*, Say, belongs to a variety with black thorax and spotted elytra, while *4-guttatus*, Lec., has a yellow or reddish thorax and spotted elytra. Others occur, but not having been recorded from the region under consideration, they are passed by for the present. A full account of them will be found in Dr. Horn's paper.

CHRYSOCHUS, Redt.

A common species on the Dog's-bane (a milk-weed) is *C. auratus*, Fabr., a large green-bronze beetle, about .40 in. long, often with the most brilliant golden reflections. The body is rather more elongate in form than the preceding species and very convex. There is also a record of *C. cobaltinus*, Lec. (properly a Pacific Coast species), which is of blue colour, sometimes with a touch of green.

TYMNES, Chap.

L. tricolor, Fabr., is a rather brilliant beetle, about .25 in. long, metallic green or bronzed in colour, the legs almost always reddish or yellowish, the upper lip pale. Elytra coarsely punctured, acute at apex; "anal segment often pale, especially in the males, in which sex that segment is broadly emarginate and with a transverse depression" (Horn).

XANTHONIA, Baly.

Here belong two Canadian species. They are small beetles with broad elytra and narrower thorax, as in *Adoxus*, the upper surface finely pubescent. Dr. Horn separates them thus:—

Punctures of elytra very confused, with a feeble seriate tendency towards the sides; elytra usually dull ochreous with piceous spots, but sometimes entirely fulvous. .12 in. *decemnotata*, Say.

Punctures of elytra much finer and arranged in regular series, but slightly confused near the suture; colour usually pale fulvous, varying through brown or piceous, not spotted.

.12 in. *villosula*, Mels.

With the last species is united *X. Stevensii*, Baly.

GRAPHOPS, Lec.

Small species of more than usually cylindrical form and metallic green or coppery colours. The prothorax is rugose, at least on the sides, and the elytra pubescent with rather large striæ composed of distant punctures. The two species from the region under consideration are:—

Larger (.16 in.). Prothorax punctured, rugose at sides. *pubescens*, Mels.

Smaller (.10 in.). Prothorax rugosely punctured over the whole disk. *curtipennis*, Mels.

METACHROMA, Lec.

Contains species which resemble in form the well-known *Typophorus*, but with post-ocular lobes. Two are found in Eastern Canada.

Posterior femora simple; thorax densely punctate, somewhat strigose; usually black, elytra sometimes with a humeral and apical spot (occasionally united along the margin) dull red. Legs pale in Northern specimens. .12-.14 in. *quercatum*, Fabr.

Posterior femora with a small tooth on lower edge about one-third from the knee; thorax scarcely at all punctate; colour variable, from entirely pale through forms with black thorax, suture and elytral spots to those completely black excepting the legs. .13-.18 in. *dubiosum*, Say.

COLASPIS, Fabr.

Here belongs *C. brunnea*, Fabr. (*suilla* of the Society's List), a pale brownish or yellowish beetle, of oblong-oval form, the elytra costate, the

spaces between these costæ being occupied by two irregular rows of coarse, deep punctures. It is extremely variable and the varieties have received names as follows: *suilla*, Fabr., is applied to the form in which the head and thorax are brown with slight metallic lustre; *costipennis*, Cr. (*Crotchii*, Lefvr.), to those specimens with brilliantly metallic head and thorax and brown elytra with yellow costæ; while *flavida*, Say,

is the yellowish-testaceous form, merely a little darker beneath. [Horn.] Length, .16-.24 in. Fig. 17 represents *C. flavida*, natural size and magnified. Fig. 18, the larva, highly magnified.

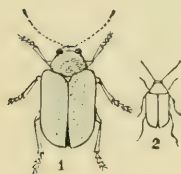


Fig. 17.

RHABDOPTERUS, Lefvr.

The insect formerly known in collections as *Colaspis prætexta*, Say, has been referred to this genus, and Dr. Horn has substituted the older name, *picipes*, Oliv., therefor. It will therefore stand as *Rhabdopterus picipes*, Oliv. It is a rather brilliant bronzed or greenish insect, .16-.20 in. long, of oblong-oval form, very convex above. The antennæ are testaceous with darker tip, under surface of body greenish, abdomen brown, tip paler, legs testaceous. Elytra with coarse, irregular punctures on the disk, apex substriate.

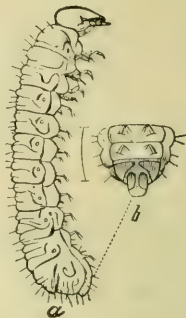


Fig. 18.

NODONOTA, Lefor.

Includes species formerly placed in *Colaspis*. Our species are all rather small insects, of convex form, something like *Colaspis*, but shorter in proportion; in colour more or less metallic, bluish or greenish, legs piceous or testaceous. Dr. Horn separates the three species (formerly recognized only as varieties) found in our region as follows:—

Form short, oval, punctuation of prothorax simple.

Upper surface shining; metasternum not punctate at sides. .11-.15 in. *tristis*, Oliv.

Upper surface dull; metasternum coarsely punctate at sides. .15-.18 in. *convexa*, Say.

Form oblong, subparallel, punctuation of prothorax substrigose; elytra with distinct costa behind the umbone.

.13-.17 in. *puncticollis*, Say.

NOTES ON SOME MOTHS FROM THE COLLECTION OF
MR. A. BOLTER.

BY HARRISON G. DYAR, PH. D., NEW YORK.

Hepialus hyperboreus, Möschler.

This species exhibits a well-marked local variation. Before discussing this I would correct the account in Journal N. Y. Ent. Soc., II., 168, in respect to the synonymy of *confusus*. This form is really the same as *roseicaput*, N. & D., as the description shows. How we were misled into referring the name as a strict synonym, I cannot now recall. It may be well, moreover, to retain a distinct name for the American form until its life-history is known and we can be certain whether it is or is not the same as the European *ganna*.

H. hyperboreus occurs throughout the northern and mountainous parts of North America, from the Atlantic to the Pacific. It is recorded from Labrador [Möschler]; Mt. Washington, N. H. [Mrs. Slosson]; Colorado [Grote]; Calgary, Alberta [Wolley Dod]; Sierras of California [Hy. Edw.]; Vancouver I., B. C. [Bolter]; Cascade Range, B. C. [Neum. & Dyar]; and Alaska [H. Edw.].

The colour of primaries is brown, varying from dark to pinkish or yellowish-brown; the silvery markings are complete in all the specimens from the Rocky Mountains and eastward and south of Oregon. In the Northwest, the silvery marks begin to be distinctly replaced by the blackish shades which form their borders in specimens from Vancouver Island (*Matthewi*). In the Cascades and Alaska the specimens have no silvery marks, but are banded only with smoky blackish. The size of the specimens is variable. The largest that I have seen is Mrs. Slosson's example from Mt. Washington (50 mm.), and the smallest are some of the specimens of *McGlashani* (30 mm.). The usual size is close to 40 mm., ranging larger in the East. From present information, I would arrange the varieties and synonymy thus:—

HEPIALUS HYPERBOREUS (= *ganna* of Europe?).

hyperboreus, Möschler, 1862. Labrador and Mt. Washington; expanse, 40–50 mm.

pulcher, Grote, 1864. Colorado, and Alberta, Canada; expanse, 36–38 mm.

McGlashani, Hy. Edw., 1886. Truckee, California; expanse, 30–39 mm.

intergrade, *MATTHEWI*.

Matthewi, Hy. Edw., 1874. Vancouver Island, B. C.; expanse, 35-41 mm.

local race, *CONFUSUS*.

confusus, Hy. Edw., 1884. Alaska; expanse, 44 mm.

roseicaput, Neum. & Dyar, 1893. Cascade Range, B. C.; expanse, 33 mm.

SYNOPSIS:

Yellowish or reddish-brown, full silvery white marks . . . *hyperboreus*.
 Reddish-brown, the ground colour irregular or spotted with yellowish;
 silvery marks more or less replaced by smoky black . . . *Matthewi*.
 Pinkish or yellowish-brown, white marks all replaced by smoky
 black . . . *confusus*.

Alexicles aspersa, Grote.

A fresh specimen from Las Vegas, N. M. (The type is rubbed.)

Thorax thickly haired, dark gray-brown, touched with white at the bases of the anterior wings, along the collar on the sides below the fore wings; eyes posteriorly margined with red. Upper side of all the femora and the tips of the tibiae and the tarsal joints bright red. Abdomen bright red above except at base and a series of dorsal dark brown spots; gray-brown below, the last two segments tipped with whitish. Fore wings rather thin, grayish-brown, with five transverse rows of dark brown spots and a large discal spot, cutting the otherwise white veins. Expanse, 32 mm.

Macrurocampa Dorothea, n. sp. (Fig. 19.)

Primaries ash-gray with a lilac tint, composed of black and gray scales, quite uniform, without any contrasting pale shades. Basal space up to the t. a. line shaded with blackish-gray, filled in uniformly except the extreme base, which is pale, and a distinct longitudinal black line along vein 1 to the t. a. line, bordered on its lower side by an ochreous shade. T. a. line bounding the dark space, geminate, obscure, blackish, outwardly angled on median vein and inwardly in submedian space. Discal spot lunate, black, confined to the cross-vein. Beyond it the faint, narrow, wavy, black t. p. line crosses the wing, paralleled by a fainter median shade



FIG. 19.

through the discal dot itself and beyond by a row of small venular black dots, the three lines ending on the internal margin in a darker shade of

the ground colour. In the interspace of veins 3-4 and 6-7 basally, a triangular patch of the same ochreous tint as borders the basal longitudinal line below. Subterminally a distinct black band issues from the apex, slightly toothed outwardly on the veins, inwardly on the interspaces, and proceeds to vein 4, where it is interrupted; but reappears at vein 3, curving inward and reaching a little way along submedian fold, where it ends. Terminal field gray, scarcely lighter than the general ground, irrorate with black. Fringe dark, with obscure venular spottings. Abdomen and secondaries smoky gray, secondaries whitish at basal half. Thorax dark iron-gray, black and white hairs intermixed, the head and under side of thorax paler.

Type, one female. Las Vegas, New Mexico; collection of Mr. A. Bolter, Chicago.

The only Southern species which seems to approach this form is *Heterocampa surinamensis*, Möschler.

NOTE ON TRIGONOGENIUS FARCTUS.

BY E. A. SCHWARZ, WASHINGTON, D. C.

Thirty years ago Dr. Leconte described (New Species, Smithsonian Misc. Coll., 167, p. 100) the Ptinid *Trigonogenius farctus* from specimens received from San Francisco, Cal. Most specimens in our cabinets come from the same locality, but I have seen others from Alameda and Los Gatos, Cal. The collectors of the specimens never published anything on its mode of occurrence, and I fail to find in the literature a single record of its habits. Quite recently, however, Dr. James Fletcher, while on a visit to Washington, D. C., showed me two species of Coleoptera found living in red pepper, in Victoria, Br. Col. One is *Tribolium ferrugineum*, a common cosmopolitan Tenebrionid, which has been found before under similar conditions; but the second species proves to be *Trigonogenius farctus*. Several specimens of this were obtained, thus showing that its occurrence in the pepper was not accidental, and I have no doubt that upon further research the earlier stages of the beetle can also be found in the pepper. [Larvæ of all sizes and cocoons with pupæ in them occurred in this consignment of pepper, which was sent to me by Mr. E. A. Carew-Gibson, of Victoria, B. C.—J. F.] Dr. Fletcher informed me that Victoria gets much produce from San Francisco, and we may

thus infer that the infested red pepper came from that place. On this and various other points connected with the economy of this species, Dr. Fletcher will no doubt be able to furnish further information.

Various Ptinid beetles, *e. g.*, *Ptinus fur*, *Sitodrepa panicea*, *Lasioderma serricorne*, are very fond of red pepper, and the occurrence of *Trigonogenius* in this substance is therefore not surprising, but it brings up another point for consideration. All insects which we find in this country living in groceries, drugs, etc., are of foreign origin, or at least do not belong to the Nearctic fauna. The insects native to North America do not seem to be able, or are not inclined, to adopt this mode of life, and thus it may be questioned whether *Trigonogenius farctus* really belongs to our fauna. Its general appearance certainly bespeaks a foreign origin. The genus *Trigonogenius*, as restricted by recent authors, contains only two described species: *T. globulum*, Sol., from Chili, and *T. squalidus*, Boield., from New Grenada*, and upon comparing the original descriptions the identity of our species with *T. globulum* appears to me quite possible. I have, however, not seen Solier's figure, and a comparison with the type is apparently necessary to decide this question.

The mere feeding of these beetles and their larvæ cannot be said to injure the red pepper, which does not lose its pungent quality by passing through the bodies of insects. But should the *Trigonogenius* be very numerous, the presence of the silken pupal cocoons would cause some inconvenience and loss.

While speaking of imported Ptinidæ, I would add that at least two Old World species are most likely to find their way to North America sooner or later. One is *Niptus griseofuscus*, DeGeer (*Ptinus crenatus*, Fabr.), which appears to be a native of Europe, where it commonly occurs in old straw in cellars and stables. The other species is *Niptus hololeucus*, readily known by the appressed golden-yellow pubescence covering the entire body. It is probably a native of Asia Minor, whence it was imported into Great Britain about sixty years ago. It occurs now at many points in Western and Central Europe, not only living in all sorts of spices and drugs, but also proving to be injurious in various ways. It would be a most undesirable addition to our fauna.

*The two species described and figured by Gorham in Biol. Centr. Amer. are certainly not congeneric with *T. globulum*

THE SMALLER BEES OF THE GENUS *ANDRENA* FOUND
IN NEW MEXICO.

BY T. D. A. COCKERELL, MESILLA, NEW MEXICO.

None of the species herein described or listed are as much as 10 mm. long.

1. Marginal cell truncate.

The species of this section are not true *Andrena*, but will form a distinct genus, apparently as near to *Prosapis* as to *Andrena*. Two of the larger species, *A. asclepiadis*, Ckll., and *A. mexicanorum*, Ckll., are congeneric. I have before me also a species from Texas.*

i. Tarsi piceous in female.

Andrena trifoliata, n. sp.—♀. Length nearly 10 mm. Closely similar in all respects to *A. maurula*, but differing in being slightly smaller, the eyes dull slate colour, not at all greenish; the clypeal mark smaller, paler, and more distinctly trilobed; the front more sparsely punctured, with minute punctures between the large ones; the last 6 or 7 joints of the flagellum becoming testaceous; the wings not rufescent, but the apical half slightly smoky; the third submarginal cell more narrowed above, the first recurrent nervure entering the second submarginal cell at the end of its second third; the legs black; the abdomen with the basal white hair-bands on segments 3 and 4 entire; the hairs on venter very few, and whitish. The metathorax and postscutellum are quite black, not at all brownish. The pale, cream-coloured face-mark is shaped something like a vine leaf.

**Andrena maurula*, n. sp.—Female. Length nearly 10 mm. Black, no more pubescent than a *Prosapis*, strongly punctured. Head broader than long, face very broad; eyes rather small, dull olive green; clypeus arcuate below, its upper half, just enclosing the black dots, and extending as a rounded lobe downwards in the median line, pale primrose yellow. A very narrow, sometimes interrupted, pale yellow supra-clypeal transverse mark. Labrum prominent, truncate, with a small longitudinal keel. Clypeus with large but rather sparse punctures, median line impunctate. Front and vertex closely punctured. Antennae short, dark brown, scape punctured. Thorax somewhat shining, bare except the minutely pubescent hind border of prothorax, lower part of pleura, and lateral angles of metathorax. Median and parapsidal grooves distinct. Mesothorax and scutellum strongly and closely punctured; postscutellum and metathorax slightly brownish, coarsely granular, or so closely punctured as to seem so; metathorax with a deep pit, enclosure not defined, except by an impunctate band at sides, basally very obscurely wrinkled. Tubercles light yellow, tegulae testaceous with a yellow patch. Wings stained with ferruginous, nervures and stigma dark rusty brown, marginal cell truncate. Legs dark brown, the four anterior knees light yellow. Abdomen strongly and closely punctured, segments after the first with more or less distinct lateral basal white hair-bands. Anal fimbria ochreous. Hairs on venter more or less tinged with ochreous.

Habitat.—Texas; three collected by Belfrage, and now in U. S. Nat'l Museum. One bears the number 237.

Habitat.—Albuquerque, N. M.; two, on June 30th, 1895, between the town and the University [Ckll., 3254, 3256.].

ii. Tarsi rufous in the ♀; yellowish white in the ♂.

Andrena heteromorpha, n. sp.—♀. Length about 8 mm.; similar in build and general appearance to *A. trifoliata*, but rather more slender. Black, no more pubescent than a *Prosapis*, face-mark and tubercles pale primrose yellow. Head a little broader than long; eyes black; supra-clypeal mark very narrow, as in the other species of the group, forming the base of the clypeal mark, which is trilobed below, much rounder in general outline than that of *trifoliata*, decidedly longer in proportion to its breadth than in that or *maurula*. Mandibles simple, rufous, with the tips blackish and the bases becoming yellow. Face and front shining, strongly but irregularly punctured, vertex strongly and closely punctured. Antennæ black, the flagellum from the 4th joint becoming rufous beneath. Tubercles pale yellow with a black spot near the hind margin. Mesothorax shiny, closely punctured, parapsidal grooves distinct. Scutellum closely punctured. Postscutellum and metathorax coarsely granular, base of metathorax with small, ill-defined longitudinal wrinkles. Tegulæ testaceous, with a triangular pale yellow spot; wings smoky hyaline, nervures and stigma dark brown, the former ferruginous at base of wing. First recurrent nervure entering second submarginal cell at the end of its second third. Legs black, first four knees yellow, hind knees ferruginous; tarsi ferruginous, first joint of middle tarsi quite broad. Abdomen strongly and closely punctured, without distinct hair-bands or spots, but the last two segments pruinose with white pubescence. Anal fimbria pale ochreous.

♂. Smaller and more slender, the abdomen subcylindrical. Face wholly pale primrose yellow below level of antennæ, the upper margin of the yellow straight, only notched on each side of the dog-ear marks, and produced narrowly a short distance along the orbits. Basal portion of mandibles externally all pale yellow. Antennæ entirely dark, not at all rufescent. Second submarginal cell very narrow. Anterior tibiæ pale yellow in front; all the tarsi cream colour, except the darkened terminal joint. Abdomen with the last four segments primrose. Punctures of basal segment not so close.

Habitat—Las Cruces, N. M.; close to the Agricultural College, on *Verbesina encelioides*; Sept. 12th, 1895 [Ckll., 5056, ♀; 5058, ♂.].

2. Marginal cell pointed.

- i. ♀ with wings tinged yellowish, stigma pale ferruginous, abdomen impunctate; ♂ with clypeus dark; hind tarsi clear ferruginous in both sexes.

Andrena salicinella, Ckll., Psyche Suppt., 1895, p. 4. The type was taken on willow, but was unique, and among many bees collected on willow at the same place, May 2nd and 3rd, 1896, are no *salicinella*. Both sexes were, however, taken in quantity on *Sisymbrium canescens*, on the College Farm, Mesilla Valley, N. M., April 12th and 16th, 1895, the males predominating.

The ♂ differs by the face being covered with dense white pubescence, the flagellum ferruginous beneath; the wings clear, not yellowish; the stigma reddish brown, darker than in the ♀; the abdomen narrower, but distinctly banded. When I published *salicinella*, Miss J. E. Casad had already described the species as new (in MS.) from the ♂, but I was not aware that her insect was the opposite sex of mine.

Miss Casad has described (in MS.) another species from a ♂ taken on *Krynitzkia* (supposed to be *K. Jamesii*), on Little Mountain, Mesilla Valley, April 1st, 1895. This is smaller than ♂ *salicinella*, and the head seems very much broader in proportion to its length; but the latter feature is probably due, at least for the most part, to the retraction of the mouth-parts and the absence of the dense white clypeal pubescence, except at the sides. My present opinion is that it is probably an individual mutation of *salicinella*, but it may be a distinct but closely allied species.

- ii. Wings not tinged yellowish, hind tarsi not clear ferruginous.

- a. Clypeus dark in the ♂, abdomen tessellate but impunctate.

Andrena monilicornis, n. sp.—♂. Length about $8\frac{1}{2}$ mm. Black, with long dull white pubescence. Head broader than long, face densely covered with long white hairs, cheeks less densely; vertex bare, flattened or even slightly concave, microscopically reticulate, and with large, rather sparse punctures. Antennæ long, wholly black, the joints somewhat swollen, moniliform, first joint of flagellum not longer than the third. Mandibles wholly black. Thorax covered with long hairs; the prothorax, disk of mesothorax, scutellum, and enclosure of metathorax, bare. Mesothorax rather dull, with large, rather sparse punctures. Scutellum shiny, with sparse punctures; a small impunctate space on each side of the middle. Enclosure of metathorax dull, minutely roughened, bounded only by an impressed line. Tegulae shining dark brown. Wings hyaline, iridescent, nervures and stigma testaceous, costal nervure black. Second

submarginal cell very broad, receiving the first recurrent nervure at its middle. Legs black, apical joints of tarsi becoming dull ferruginous. Femora with very long white hairs. Abdomen moderately broad, having a silky lustre, strongly minutely tessellate, impunctate. All the segments sparsely hairy, their hind margins with thin white hair-bands, failing in the middle. Venter with continuous white hair-bands. Apex with white hairs.

Habitat.—College Farm, Mesilla Valley, N. M.; on plum; March 25th, 1896.

b. Clypeus pale primrose yellow in the ♂, abdomen punctate.

(1) Larger, distance between the clypeal dots in ♂ not greater than distance from one to top of clypeus.

Andrena capricornis, Casad and Ckll, n. sp.—♂. Length, 8 mm.; stoutly built; black, with dull white pubescence; clypeus and a large mark on each side of it very pale primrose yellow. Head broader than long, face and front with rather long but thin pubescence; clypeus large, unusually high, almost bare, with scattered punctures; there are either two minute gray dots or there may be two gray bands, extending upward and laterad from the position of the dots, meeting each other at a right angle. The lateral face-marks are irregularly diamond-shaped, the upper outer margin notched. Vertex roughened, a polished, sparsely punctured area at the summit of each eye. Antennæ fairly long, black, the tip of the flagellum beneath becoming dark coffee-colour. First joint of flagellum about as long as second and third together, second not as long as broad. Mandibles wholly black; lower margin of clypeus black, arcuate; basal process of labrum emarginate. Thorax quite densely pubescent; mesothorax dull, rather closely punctured; scutellum shiny, irregularly punctured; enclosure of metathorax granular, bounded only by an impressed line. Tegulæ dark chestnut brown, wings hyaline, nervures and stigma dark reddish brown, costal nervure black; second submarginal cell narrowed above, receiving the first recurrent nervure just before its middle. Legs black, pubescent, apical joints of tarsi becoming more or less rufescent. Abdomen rather broad and short, punctured, only moderately shiny, clothed all over with thin white pubescence, which forms ill-defined bands, interrupted in the middle, on the hind margins of the segments. When the insect is viewed from the side the bands on segments 2 to 4 look very white and distinct, as, indeed, do those on 2 and 3, viewed from above.

Habitat. — One on plum, College Farm, Mesilla Valley, N. M., April 9th, 1895 [Casad, 161]; another on plum, same locality, March 25th, 1896 [Ckll.].

- (2) Smaller, distance between the clypeal dots in ♂ much greater than distance from one to top of clypeus.

Andrena primulifrons, Casad, n. sp. — ♂. "Black, pubescence ashy, head broader than thorax; clypeus and lateral spots somewhat triangular in shape, their longest side toward clypeus and extending a little above it on sides of face, pale lemon yellow; clypeus broader than long, with black dots about half way between upper and lower edge and separated from each other by about the length of the clypeus; rest of head black, face clothed with ashy hairs and fringed at its base, vertex bare, occiput and cheeks clothed with long hair; antennæ testaceous beneath; thorax clothed same as head, hairs longest on pleura, very sparse on metathorax; wings hyaline, iridescent, nervures piceous; legs with hairs, sparsest and longest on femora; abdomen sparsely clothed with short hairs; segments banded apically. Length about 6 mm. Its general appearance is much like that of *Halictus fasciatus*." [Jessie E. Casad.]

♀. "Black, having an oily appearance, pubescence grayish, mixed with ochraceous; head very little broader than thorax, face as long as broad, clothed sparsely with short pale ochraceous hairs, those on clypeus very scattered; antennæ pale brown from fourth joint to tip beneath; thorax clothed similarly to head, metathorax bare, punctured and fringed marginally; wings hyaline, third submarginal cell long, narrowed more than one-half toward marginal, stigma fulvous, tegulæ testaceous; legs dark brownish, clothed with pale hairs, heaviest on tibiæ and tarsi; last joints of tarsi reddish; abdomen punctured, clothed with fine, short, scattered hairs; apical marginal bands interrupted on segments one and two; bands entire on following segments." [Jessie E. Casad.]

Habitat.—Mesilla Valley, N. M.; Little Mountain, April 1st, 1895, on *Krynitzkia* (supposed to be *K. Jamesii*), a ♀ [Casad, 154]; Campus of Agricultural College, on flowers of *Biscutella Wislizenii*, April 9th, 1896, a ♀ [Ckll.]; on plum, College Farm, April 10th, 1895, a ♂ [Casad, 187]; on plum, College Farm, March 25th, 1896, a ♂ [Ckll.]; on *Sisymbrium canescens*, College Farm, April 16th, 1895 [Ckll., 2790, 2742].

Miss Casad had described the sexes as distinct species, but they are doubtless one. The stigma varies in colour, being sometimes reddish

fulvous, sometimes brown; but its margin is always conspicuously darkened below. The enclosure of the metathorax is strongly granular, contrasting with a comparatively shining area on each side of it. The nervures in the ♀ are distinctly darker than in *salicinella*.

P. S.—June 2nd, 1896. After renewed study, and an examination of the tongue and palpi, I am satisfied that the supposed species of *Andrena* described by me with the marginal cell truncate represents a valid new genus, which I will call *Protandrena*. The species are as follows: *P. asclepiadis*, *P. mexicanorum*, *P. trifoliata*, *P. maurula*, *P. heteromorpha*.

LEPYRUS ALTERNANS AND CAPUCINUS, LIXUS FOSSUS,
CREMASTOCHILUS HARRISII AND POLYPLEURUS
NITIDUS.

BY JOHN HAMILTON, M. D., ALLEGHENY, PA.

Lepyrus alternans, Casey.—In a former paper (p. 125) the form described under this name was united with *Capucinus*, Schall, owing to an error of observation in regard to the wings. The example then examined was somewhat broken and it is now evident the wings had been removed. A recent dissection of a perfect specimen exhibits a well-developed pair of wings. This form is closely related to *palustris* (perhaps not more than a geographical variety), differing in the form of the thorax, which, instead of being conical, is much wider at middle than at base (subangulate); the rostrum is perhaps stouter and the mesosternum less elevated—both characters somewhat opinionative; there is no femoral tooth in any of the examples seen; the elytral intervals are less regular, either not obviously unequal or the first and third wider, the others narrower and some of them longitudinally sulcate along the middle; the striae punctuation is usually finer and closer, and the striae seem to be acutely impressed when the elytra are perfectly denuded. In vestiture ornamentation and other characters the two forms seem identical.

All the examples seen have been from Maine and New Hampshire (Mount Washington and vicinity).

L. capucinus, Schall.—The removal of *alternans* from synonymy with this species necessitates a little change in the former description, where some of the characters peculiar to the latter form were introduced:—

Apterous, black, robust, vestiture nearly uniform. Rostrum stout, longer than the thorax, sulcate on each side of the carina which attains the frontal fovea, rather closely and not coarsely punctured, and with the head thinly clothed with squamoid hairs; scape of antennae short, not attaining the eye; first joint of funicle stout, second thinner and

two-thirds longer, ferruginous to piceous. Thorax transverse, wider than long, sides nearly parallel to apical third, then rapidly rounding to apical constriction; apex one-fourth narrower than base. subconvex, surface even, closely covered with granuloid tuberculations, smaller on the disk, larger and rugous on the sides; median carina fine, mostly attaining the base. Elytra oval, striato-punctate, striae when denuded slightly acutely impressed, intervals not obviously unequal, granuloid tubercles fine and sparse; apices conjointly rounded, notch very slight. Anterior femora with the sinuation for the tibiae strongly rectangularly laminate and usually the middle and posterior; mesosternum elevated between the coxae. The vestiture is very uniform, mostly of white and gray fine hairlike scales tessellated on the elytra, sparser below; the median spot on the elytra usually seen in the other species is absent, but there is a white one on each apical protuberance; the femora are not annulated and the abdominal spots are wanting. The American examples seen are from Michigan; the European, from Hungary.

L. gemellus, Kirby.—This elegant species was taken by Mr. F. C. Bowditch, in the Rocky Mountains near Eagle Pass, at an elevation of 13,000 feet or over, examples of which, through his courtesy, I have been enabled to see. From these the recorded distribution is Vancouver Island; Alaska (the Peninsula of Kenai and the adjoining Continent, also the Yukon); the Hudson Bay region to Lat. 65°. In the former notice, p. 126, the word "scalerous" should read scabrous.

Lepyryus palustris.—Examples from Indiana in the cabinet of F. H. Snow, Chancellor of the University of Kansas, are absolutely identical with the cylindrical, long-beaked European form usually sent to America.

Lixus fossus, Lec., 1876, Proc. Am. Phil. Soc., XV., 417; *luculentus*, Casey, Ann. N. Y. Acad. Sci., VI., 209.

Fossus was described from a unique taken at Enterprise, Florida; *luculentus* from examples taken at Lake Worth, Florida, about 250 miles southward. Except in size, the individuals of this species are little variable, but enough so to make two or three species of by any one inclined in that direction. Mr. Casey's types seemingly differ from Dr. Leconte's in three or four points which more ample material shows to possess only individual value. The material in my collection, ♂ and ♀, is from near Jacksonville and from Lake Worth, the latter due to the munificence of Mrs. Slosson, who recently sent me nine examples. The ♂ examples from Jacksonville agree with Dr. Leconte's description of the thorax and basal fovea, the ♀ with his description of the supposed ♀ which is the ♀ of Mr. Casey's *luculentus*. In the males of the examples from Lake Worth the thorax and basal foveae are diverse, some as in *fossus*, some as in *luculentus*, and others intermediate. The characters drawn from the beak are likewise mutually intermixed.

The following description drawn from 10 male examples illustrates

the principal characters of the species, with the most noteworthy differences observed among individuals:—

Beak about as long as the thorax, sometimes longer, mostly shorter; a broad transverse impression between the eyes more or less evident; a round frontal fovea, a smaller elongate one between the insertion of the antennæ sometimes obsolescent; in some examples a trace of a carina between the foveæ, but usually not; punctuation fine and sparse to coarser and denser, clothed with minute whitish scales to tip; antennæ inserted about one-third from apex, slender, light to dark ferruginous; club mostly darker; thorax about as long as wide, sometimes longer, sometimes shorter, conical; process of base prolonged more or less acutely between the elytra in place of the scutellum, which is not visible; fossa deep, sometimes limited at basal third, sometimes the impression extends to middle and sometimes narrowly to apical margin, densely rugoso-punctulate; some fine punctures, mostly on the sides; elytra not or but little wider than the thorax, with irregular series of moderately coarse punctures, of which the inner three are usually well defined; tips separately acutely rounded and conjointly emarginate; uniformly mottled with condensed spots of short white scaly pubescence, as is likewise the thorax and under side, the latter also ornamented with numerous denuded black dots; femora annulate with white.

Length, .30-.40 inch. Habitat.—Common from Jacksonville, Fla., southward.

The denuded elytral area mentioned by Mr. Casey is entirely due to abrasion, as is also that of the disk of the thorax, neither being present in recent specimens. The surface in some of the examples is covered with a yellow pollenoid powder such as is seen in *conconvus*. The female seemingly differs from the male only in the more cylindrical, slightly longer, less pubescent, and more finely punctulate beak, with the antennæ inserted near the middle, and the usually longer thoracic impression.

Cremastochilus Harrisii, Kirby.—This species was taken, by myself, with ants (species not observed) in Western Pennsylvania [CAN. ENT., XX., 160]; also in Florida, with a large ant inhabiting under a board [Ib., XXVI., 255], which Prof. Schmitt names *Camponotus floridanus*. In March, 1895, I took an example with the same species of ant at Lake Worth, under circumstances somewhat different from the ordinary. A small pine had been broken off by a wind-storm about six feet from the ground, the broken end resting on the stump; under the loosening bark of the tree a colony of ants had formed a nest, and in it was this *Cremastochilus*; the ants were in great consternation at the exposure of their habitation, and while anxious and in much hurry to remove their pupæ to places of safety, they appeared to be equally solicitous about the *Cremastochilus*, several of them laying hold of it and dragging it with them. At first it simulated death, but after having been dragged awhile it got up and walked off quite lively under their guidance.

Polypheurus nitidus, Lec.—This fine beetle, rather rare in collections, is abundant along Lake Worth, Florida, in pine hummocks where there are stumps. The larva when full-grown is about an inch and one-half in

length, cylindrical but a little flattened, about one-eighth of an inch in diameter; the body is hard, solid, and not easily crushed; the mandibles large, sharp, and powerful enough to draw blood; the colour is pale yellow with the head piceous. It is very active. The beetle breeds in pine stumps which have been cut two or three years and have dried out; the larvæ devour the solid wood always in a vertical direction, two or three dozen of them being frequently found in a stump six or eight inches in diameter, the inside of which is mostly reduced to powder by the time they are ready to pupate. I took the beetle from February to May, and it may possibly disclose at all times during the year.

This species is probably not confined to pine, as I took it frequently quite remote from any pine, under boards, bark, etc., and I strongly suspect that it breeds in roots, etc., after the manner of some of the Elaterid larvæ called "wireworms."

TWO NEW HESPERIDS.

BY HENRY SKINNER, PROF. ENT., ACAD. NAT. SCI., PHILADELPHIA.

Pamphila Howardi, n. sp.

Male.—Expands 1.50 inches. *Upper side*: Superiors tawny with a fuscous border a little more than one-eighth inch in width; there are from one to four small subapical tawny spots in the fuscous border; at end of cell a dark spot which may or may not be connected with the stigma; stigma rather more than an eighth inch in length, very narrow and unbroken, and extending to inner margin. Inferiors have the same fuscous border and tawny central area. *Under side*: Superiors with tawny central area and border same as upper side; there is a large triangular spot extending into the wing from the base. The tawny colour above this spot is of a darker hue than that below and outside of it. Inferiors very light brown, generally with four or five very faint tawny spots in the central area.

The females are larger, without the stigma and have the under side of inferiors immaculate. Described from eight specimens in my own collection and four in that of the U. S. National Museum, through the courtesy of Prof. L. O. Howard. They are all from Florida; two being from Georgiana, on the Indian River; exact locality of others unknown. This species has usually been confounded with *viator*, but is really nothing like it. The species belongs to the *arpa*, *palatka*, *Aaroni*, *viator* group. It

is a much larger species than *Aaroni*; it has not the bright immaculate inferiors below like *arpa* and differs from *palatka* in the stigma, which in that species is in two short sections. The superiors in *viator* above are fuscous, covered with tawny spots.

Pamphila stigma, n. sp.

Male.—Expands $1\frac{1}{4}$ inches. *Upper side*: Superiors bright yellow; border fuscous, about one-sixteenth of an inch in width; the fuscous extending slightly inwards into the yellow between the veins. Stigma broad, black, and semicircular; very wide in proportion to its length; extending from stigma toward tip of wing is a rectangular fuscous spot. Inferiors fuscous with an orange central area which is broken into four or five spots by the nerves. *Under side*: Superiors yellow with the usual fuscous patch at base; there are five fuscous spots on the outer third of wing, which begin at the inner margin and extend upward, each one being smaller than the other as they extend toward the outer third of the centre. Inferiors bright yellow, a few small fuscous spots scattered about the wings. From several specimens in the collection of the author and Dr. Herman Strecker, of Reading, Pa., from southern border of New Mexico and S.-W. Texas. This species somewhat resembles *brettus* and *phyleus*, but can be known at once by the stigma, which is like that of *campestris*.

ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

The Association of Economic Entomologists will hold its eighth annual meeting in the Library Building, Buffalo, N. Y., on Friday and Saturday, August 21st and 22nd, 1896. The first general session of the American Association for the Advancement of Science will be held on Monday, August 24th, 1896.

It is earnestly requested that members of the Association of Economic Entomologists should promptly inform the Secretary whether they expect to be present or not, and also submit immediately the titles of communications they desire to present, to enable the distribution before the date of the meeting of a preliminary programme.

Full information relating to railroad rates, hotels, etc., is given in the preliminary bulletin of the American Association for the Advancement of Science, a copy of which may be obtained by addressing the local Secretary, Mr. Eben P. Dorr, care of Society of Natural Science, Buffalo, N. Y.

C. L. MARLATT, Secretary.

U. S. Department of Agriculture, Washington, D. C.

BOOK NOTICE.

MONOGRAPH OF THE BOMBYCINE MOTHS OF AMERICA NORTH OF MEXICO, including their transformations and origin of the larval markings and armature. Part I., family 1, Notodontidæ. By ALPHEUS S. PACKARD. National Academy of Sciences, Vol. VII., 1895 (received May 11th, 1896); 292 pages, 49 plates, and 10 maps.

Dr. Packard's long-promised monograph has at length appeared. The copious text is divided into ten sections: I., Introduction; II., Hints on the mode of evolution of the bristles, spines and tubercles of Notodontian and other caterpillars; III., On certain points in the external anatomy of Bombycine larvæ; IV., On the incongruence between the larval and adult characters of Notodontians; V., Inheritance of characters acquired during the lifetime of Lepidopterous larvæ; VI., Geographical distribution of the American Notodontidæ; VII., Phylogeny of the Lepidoptera; VIII., Attempt at a new classification of the Lepidoptera; IX., A rational nomenclature of the veins of the wings of insects, especially of the Lepidoptera; X., Systematic revision of the Notodontidæ, with special reference to their transformations.

Most of these have previously appeared as separate articles, as the reader will recall. The life-histories are given as fully as our present knowledge will allow, much of this knowledge being due to Dr. Packard's own labours. The plates illustrating them are beautifully coloured, the early stages highly magnified. These plates must be seen to be appreciated.

A few remarks in criticism of the memoir will not be understood to imply a lack of appreciation of its many valuable features. In general the synoptic tables of subfamilies, genera, and species are poor and uncritical. They are no improvement over those of the author's monograph of Geometridæ, to which the same criticism applies. In all the figures of larvæ the setæ are imperfectly shown, and their number and position are not to be relied upon. I corrected for Dr. Packard a number of the plates in this respect, but the corrections were necessarily made from memory and on general principles, and there is not a figure which has the authority of a careful copy from nature. Even the special figures in the text are often very erroneous; *e. g.*, figure 9, on page 63, where the back and side views of the same larva are shown as different. Dr. Packard also fails generally to describe the arrangement of the setæ in the text.

The classification of the Lepidoptera which is used is original with the author. It has been already presented in the *American Naturalist*, where I have had occasion to notice it. In rejecting the classification of Prof. Comstock, the author argues that the frenulum is of small value in classification, because both frenulum and jugum are present in some Jugatæ, and the frenulum is absent in some Frenatæ. While we may admit this argument for what it is worth, it seems that Dr. Packard entirely misses the great cumulative force of the evidence adduced by Prof. Comstock and others for these suborders. Classifications founded on the venation alone [Hampson], the wing scales [Kellogg], and the antennæ [Bodine] give the same suborders. I have also shown that the larval characters do not support Dr. Packard's view. But Dr. Packard gives no weight to larval characters, in spite of the implication in the title.

HARRISON G. DYAR.

NOTES.

COLIAS CÆSONIA.—Messrs. C. T. Hills and C. H. Tyris captured no less than fifteen specimens of this Southern butterfly (Fig. 20) on the 11th of June, besides worn specimens that they let go. "They were flying quite abundantly, mostly in a south-easterly direction, crossing the Humber River near Toronto, where the Canadian Pacific Railway bridge is." One specimen was also taken by them on June 14, near Little York. This butterfly has only once before been recorded from Ontario, having been taken on Long Point, Lake Erie.



Fig. 20.

PAPILIO AJAX.—At the end of May, and again on the 18th of June, a single specimen of this butterfly was seen at Port Hope, Ont. It has never before been observed so far east in this Province. In Toronto four specimens have been seen by Mr. C. T. Hills during the month of June this year.

Mailed July 6th.

The Canadian Entomologist.

VOL XXVIII.

LONDON, AUGUST, 1896.

No. 8.

NEW BEES OF THE GENERA XENOGLOSSA AND PODALIRIUS (ANTHOPHORA).

BY T. D. A. COCKERELL, MESILLA, NEW MEXICO.

Xenoglossa patricia, n. sp.—♂. Length about 22 mm., very stoutly built; head and thorax black, densely covered with short fulvous pubescence; abdomen and legs bright chestnut red. Head broad, eyes black, orbits somewhat converging above, ocelli very large, a linear groove descending from middle ocellus, vertex obscurely tessellate; clypeus broad, yellow, its upper margin suffused with orange, and its anterior margin narrowly rufous; surface of clypeus rough so as to look like the skin of a lemon; labrum yellow, with appressed, very short, pale fulvous pubescence; mandibles long, simple, with a large yellow patch near the base, suffused outwardly into a reddish tongue, which gradually loses itself in the black of the tips. Antennæ hardly reaching beyond tegulæ, piceous, with the scape, funicle, and first and last joints of flagellum, rufescent. First joint of flagellum longer than the two following, but not so long as the three following. Sculpture of thorax cannot be seen for the pubescence. Tegulæ reddish-testaceous. Wings smoky, nervures piceous, venation as in *X. fulva*. Legs with appressed orange-rufous pubescence, spurs rufous, claws black at ends, strongly bifid, spur of anterior tibia with a broad hyaline wing, as is also the case with *X. fulva*. Abdomen moderately shining, with small, close punctures; first segment with fulvous pubescence at base, the rest bare, but for the fine reddish-fulvous pile, conspicuous when the abdomen is viewed from the side. Ventral segments fringed with reddish-fulvous hairs. Apex produced, black at the broadly truncate end; the apex is more produced and much narrower than in *X. fulva*. Sixth segment with a broad blunt tooth on each side.

Habitat.—Mesilla, New Mexico. At about a quarter to nine on the morning of June 21, 1896, the day being very hot and rather cloudy. I opened, in the town of Mesilla, a number of flowers of *Cucurbita perennis*. The flowers contained great numbers of *Diabrotica* 12-

punctata, but, in addition, each fresh flower contained a single bee. On sorting out the bees after returning home, I was astonished to find they were all of the genus *Xenoglossa*, and included three species, viz.: *X. pruinosa*, Say, 4 ♂; *X. patricia*, n. sp., 1 ♂; *X. cucurbitarum*, n. sp., 3 ♂. *X. patricia* is nearest to *X. fulva*, but it is larger and stouter, and the head and thorax are black. It has no resemblance to any of the other species. Smith's *Melissodes rubricata*, from Oajaca, Mexico, is coloured much like *X. patricia*; may it perhaps be a *Xenoglossa*? It differs from *patricia* by the black pubescence on the legs, etc.

Xenoglossa cucurbitarum, n. sp.—♂. Length about 20 mm.; not so stout as *X. patricia*; black, thorax covered with short orange-fulvous pubescence, legs bright chestnut-red. Head broad, orbits nearly parallel, eyes black; face, cheeks and occiput with rather thin pubescence, long and fulvous on occiput, becoming whitish on cheeks and lower part of face. Vertex more or less punctured, the punctures running into linear grooves on the front. A shining channel descending from middle ocellus. Clypeus closely punctured, lemon-yellow, with its whole upper margin and extreme sides rather broadly black, anterior edge rufous, simple. Labrum yellow, with pubescence as in *patricia*. Mandibles with a large yellow patch, the outer end of which becomes rufous. There is a large, short tooth on the inner side of the mandibles, not far from the base;—this is wanting in *patricia*. Antennæ reaching only to tegulæ, piceous, scape and flagellum dark rufous; first joint of flagellum a little longer than the two following together. Tegulæ reddish-testaceous. Wings smoky, nervures piceous, venation as in *patricia*. Legs with short reddish-fulvous pubescence, spurs rufous, claws black at ends, strongly bifid. Abdomen black, shining, punctured, base of first segment with fulvous hairs; second segment at sides, and the other segments all over, more or less covered with very short, appressed, fulvous pile. Apex produced and truncate, much as in *patricia*. Sixth segment with a tooth on each side.

Habitat.—Mesilla, N. M., as described above.

The following table will serve to separate the species of *Xenoglossa* :—

Legs, except the tarsi, black.

Flagellum ferruginous or testaceous, at least beneath; ♂ with a transverse yellow band on clypeus *ipomææ*, Rob.

Flagellum black, or nearly so; ♂ with a yellow spot on clypeus, sometimes wanting; ♂ with first joint of flagellum very short *pruinosa*, Say.

Legs wholly rufous, or fulvous; ♂ with first joint of flagellum long.

Head and thorax fulvous.....*fulva*, Smith.

Head and thorax black.

Abdomen chestnut-red.....*patricia*, Ckll.

Abdomen black.....*cucurbitarum*, Ckll.

X. pruinosa, I have from Pennsylvania and New York; thence to Mesilla is a wide range. *X. fulva* ranges from Lower California to Arizona and southward to Puebla, Mexico; its range seems not to touch that of *pruinosa*. *X. ipomææ* is only known from Carlinville, Illinois, where Mr. Robertson found it and *X. pruinosa* visiting *Ipomæa pandurata*.

The above was written June 21. On June 22, at about 7:45 a. m., the flowers of *C. perennis* were open, and about twenty minutes collecting yielded: *X. pruinosa*, 5 ♂; *X. patricia*, 2 ♂, 1 ♀; *X. cucurbitarum*, 4 ♂, 4 ♀. The honey bees were also visiting the flowers, but seemed disconcerted to find fat *Xenoglossæ* at the bottom of them. In one flower was found an *Agapostemon texanus*, which, it may be remarked, is not so blue with us as Cresson's Texan types, though otherwise agreeing.

The females of *X. patricia* and *X. cucurbitarum* resemble the males in size and appearance; the scopa of the hind legs is fairly abundant, but loose; it is distinctly plumose. In both, the rufous hind tibiæ, on the outer surface, exhibit many small black spots. The legs of *cucurbitarum* ♀ are suffused with black at the base, to a variable extent. In *patricia* ♀ the clypeus and labrum are rufous, the mandibles are rufous without at base, and present a reddish-orange streak on the distal half, this being separated from the rufous by black. In *cucurbitarum* ♀ the clypeus is black, with sometimes an obscure reddish or yellowish spot near the anterior edge, its outline not clearly defined; the labrum also is black, reddish at its upper median border; the mandibles have an obscure yellow spot near the base, and sometimes a streak as in *patricia*. The hairs surrounding the pygidium in both species are bright orange-fulvous.

Podalirius cleomis, n. sp.—♂. Length, 12 mm., stout, black. Head broad, with long but not very dense pubescence, gray and black mixed, hairs on cheeks beneath long and white. Clypeus (except broad black lateral borders), a narrow supraclypeal band interrupted in middle, triangular lateral face-marks, labrum (except a black boss on each side next to upper margin), and a large patch on outside of mandibles, pure white.

When the face is viewed somewhat from below, it is seen that the anterior margins of both clypeus and labrum (which has a small notch) are black. Antennæ black, the scape white in front. The lateral face-marks are divided above by a broad rounded notch into a linear portion extending a little way along the orbital margin, and a broad rounded portion adjacent to the clypeus. Clypeus and labrum punctured, disc of labrum somewhat confluent punctured. Sides of vertex with very small, close punctures; large, scattered punctures behind the ocelli, which are pale honey colour. Thorax densely covered with mixed gray and black pubescence, the sides with little black. Tegulæ black. Wings rather short, hyaline tinged with smoky, nervures and stigma piceous. Legs black, the joints of the tarsi after the first dark ferruginous. First four femora fringed behind with long white hairs. Middle tarsi simple. Hind tibiæ stout, with a long, obliquely-placed spine a short distance from the end. The hind femora are also quite stout, but not so stout as the tibiæ. First joint of hind tarsi broadened, with a conspicuous erect tooth not far from the base. Hind tibiæ with short grayish pubescence, appearing white in some lights. Inner surface of first joint of hind tarsi with short orange-rufous pubescence. Abdomen short and broad, first segment with sparse long grayish hairs, the remaining segments almost nude, the margins of segments 1-6 broadly cream colour or pale yellowish—this colour sharply defined from the black. Apex with two short, widely-separated spines, and short rufescent hairs.

Habitat.—Santa Fé, N. M., August, on *Cleome serrulata*. (Ckll., 1767.) This species is interesting as representing apparently a northward extension of a neotropical type. It resembles the *P. marginatus* (Smith), which Cresson says is found at Orizaba, Mexico; and still more the Mexican *P. tarsatus* (Sichel MS., Dours), from which it differs in the lack of fulvous pubescence, and the white instead of yellow face-marks. Dours says the basal joint of the hind tarsus of *tarsatus* has two spines; in *cleomis* the tibial spur crosses the tarsal spine and, projecting beyond, looks like a second spine. Could Dours have been misled by such an appearance? Dalla Torre, it may be remarked, has proposed to change the name *tarsatus* to *Doursii*, because of preoccupation; but the change is not needed if *Habropoda* be held valid, the other *tarsatus* being of that genus.

Among the U. S. species, *cleomis* resembles *P. californicus* (Cr.) and *P. texanus* (Cr.). From the former it is distinguished by the large

admixture of black in the pubescence, and from the latter by the colour of the pubescence and the black tegulæ. Cresson describes only the ♀ of *texanus*.

Besides the type specimen of *cleomis*, I have two others taken at Santa Fé, in August, by V. Boyle. It may be added that *P. cleomis* shows a considerable superficial resemblance to the European *P. albigenus*, Lep., which I have from Marseilles [E. André], but in *albigenus* the abdominal bands are due to pubescence, as in *alamosanus*.

Podalirius alamosanus, n. sp.—♀. Length about 14 mm.; anterior wing, 9 mm.; stout, black, with cinereous pubescence. Head broad, densely pubescent, except on lower part of clypeus and sides of vertex, which are bare; the pubescence cinereous, becoming tinged with ochraceous and mixed with black on occiput and middle of vertex. Face wholly black. Vertex roughened, and with sparse, indistinct punctures; clypeus rough from dense confluent punctures. First joint of flagellum as long as the second, third and fourth together, second shorter than third. Thorax densely covered with ashy pubescence, becoming dull white beneath, tinged with ochreous and mixed with black (especially on scutellum) on dorsum. Tegulæ fuscous, hairy on anterior half. Wings smoky-hyaline, nervures and stigma piceous, venation normal. Legs black with cinereous pubescence, apical joints of tarsi rufous. Hind tibiæ with short black hairs on inner surface; basal joint of hind tarsi with dark chocolate or fuscous pubescence on inner surface, and a black brush at tip. Abdomen black, the exposed parts with obscure sparse black pubescence; the whole of the first segment, and broad apical margins of segments 2 to 4, covered with very pale ochraceous hairs. Fifth segment with black pubescence, and a patch of pale ochraceous hairs on each side. Ends of ventral segments with pale hairs.

Habitat.—Cañada Alamosa, New Mexico, June 18 [C. H. T. Townsend]. The light abdominal hair-bands are very conspicuous and nearly uniform in width. This species seems to be quite closely allied to *P. mexicanus* (Sichel MS., Dours), but that is larger (17 mm.) and has the pubescence fulvous. Unfortunately, Dours's short description of *mexicanus* contains no reference to the hind tarsi, 5th abdominal segment, etc. The locality of *mexicanus* is vaguely given as Mexico, but the types came from de Saussure, and were probably collected by him on the tableland.

Podalirius vallorum, n. sp.—♂. Length, 12 mm.; anterior wing, 8 mm.; fairly stout, black, head and thorax with dense pale fulvous

pubescence, becoming white on cheeks beneath and lower part of pleura; a very few black hairs on dorsum of thorax. Head broad; vertex shiny, somewhat roughened, sparsely punctured; clypeus rather sparsely punctured. Clypeus (except the narrow anterior margin and a sutural mark on each side above), a supraclypeal band, lateral face-marks, labrum (except the usual pair of spots), a large patch on mandibles, and the scape in front, all lemon-yellow. First joint of flagellum longer than second, and a little longer than third, but not so long as $2 + 3$. Antennæ reaching a little beyond tegulæ. Tegulæ reddish-testaceous. Wings perfectly hyaline, nervures piceous. Second submarginal cell narrowed fully one-half above. Legs black, claws ferruginous at base. First four femora with long white hairs behind, hind femora with shorter black hairs. All the tibiæ with appressed pale mouse-gray pubescence on outer side, the four hindmost with black hairs on inner surface. Hind tibiæ somewhat dilated, and bearing a sharp tooth near the end, close to the origin of the spurs. Pubescence of basal joint of tarsi as described for tibiæ; basal joint of hind tarsi dilated, flattened, with a short tooth at the side. Intermediate tarsi simple and ordinary. Basal segment of abdomen with long pale ochraceous hairs; the remaining segments with thin, appressed, grayish-white pile on their hindmost halves, not forming bands. Hind margins of segments narrowly hyaline. Extreme apex with black hairs. The eyes in life are of a beautiful dark green.

♀. Similiar, but the pubescence more cinereous, and on occiput and the whole dorsum of thorax strongly mixed with black. Face and antennæ wholly black, mandibles with a pale line. First joint of flagellum about or almost as long as $2 + 3 + 4$. Middle of 5th abdominal segment with black hairs, sides with white hairs. Basal joint of hind tarsi with a conspicuous black brush. Wings perfectly clear as in the ♂.

Habitat.—Common at Mesilla and Las Cruces, New Mexico. I first took this species on *Solanum elaeagnifolium*, at Las Cruces, July 13, 1893 [Ckll., 313]. The specimen, a ♀, was identified by Mr. Fox as *urbana* of Cresson. Later, I found both sexes at Las Cruces, visiting the flowers of *Ipomœa*. At Mesilla, in the fourth week of June, the species was observed in great numbers, nesting in adobe walls. Up to the present day (June 23) I had no doubt that the insect was really *urbana*, but on more particularly examining a ♂, it was at once evident that it was a distinct species, and further study indicated that it was new. As in the fly-genus *Dolichopus*, this section of *Podalirius* presents us with a

series of females only with great difficulty to be distinguished, but accompanied by males presenting remarkable differences in the armature and clothing of the legs. The females of *P. lesquerelle*, Ckll., ined., are very like those of *P. vallorum*, but are somewhat larger, have rather shorter antennæ, and fly earlier in the year—in April. But the males of *lesquerelle* present a remarkable broad brush of black hairs on the last joint of the middle tarsi, while the basal joint of the hind tarsus is ordinary and unarmed.

The ♀ of *lesquerelle* I have recognized in two specimens taken by Miss Jessie Casad: one at *Lycium* on the College Farm, Mesilla Valley, April 16; the other on cherry, at Mesilla, April 14. In size and general appearance it is like the ♂.

A NEW GRAIN BEETLE.

BY F. H. CHITTENDEN, WASHINGTON, D. C.

The recent discovery that the grain-feeding tenebrionid, *Palorus melinus* or *depressus* of American collections and literature, was in reality composed of two distinct species, as announced by the writer in the May number of *Entomological News* (Vol. VII., p. 138), finds a parallel in the recognition of *Silvanus mercator*, Fauvel, in local collections with *S. surinamensis*, Linn.

The former was not described until 1889 (see *Revue d'Entomologie*, Vol. VII., p. 132), and has hitherto been unrecognized in America, although M. Fauvel surmised that the species was cosmopolitan, from its relationship to *surinamensis*, *et al.*, and its occurrence in France, New Caledonia, and Africa.

From examination of between two and three hundred specimens brought together mostly by myself, in connection with the investigation of insects affecting stored products, for the Division of Entomology of the U. S. Department of Agriculture, I am able to verify this opinion regarding its distribution. This material includes an example from Kaiffa, Syria, identified by one of our first European authorities, Mr. Edm. Reitter. At the Columbian Exposition I collected examples in exhibits of cereal and other seeds from Venezuela, Liberia, and Italy; from the Atlanta Exposition were also obtained specimens from Venezuela; and quite recently the species was received at the Department of Agriculture, in a lot of ground flaxseed, from Mr. H. G. Wolfgang, of Calla, Ohio. There are in the National Museum specimens from Los Angeles, Cal.,

and Astoria, Ills., and I have now living material from an unknown source, but taken at Washington, D. C. To this list of localities may be added Lower California and Arizona, from the collection of Mr. Henry Ulke, of this city.

The close relationship of *mercator* to *surinamensis* makes reasonably certain their virtual identity as regards development, nor is it probable that they differ in any degree in food habits.

The principal points of structural difference between these two species may be best expressed in tabular form, thus:—

Tempora long, equal to about $\frac{2}{3}$ the diameter of the eye; ♂ with side margins of front strongly reflexed, and with trochanters large, terminating in a spine.....	<i>surinamensis</i> .
Tempora very small, tuberculiform, equal to about $\frac{1}{5}$ the diameter of the eye; ♂ with side margins of front less prominent, trochanters unarmed.....	<i>mercator</i> .

A third species, *S. bicornis*, Er., also strongly resembling *surinamensis*, and differing chiefly in having the side margins of the front developed into two conspicuous horns, has similar habits, and as it is apparently better known in Europe than *mercator*, may occur with us, though as yet I have been unable to discover it.

NOTE ON MAMESTRA COMIS.

BY A. RADCLIFFE GROTE, A. M.

This species is described by me in Bull. Buff. Soc., N. S., III., 85, not in the Geological Survey, as quoted in the Washington Catalogue. A comparison of the description proves that the insect before me could not have been *M. olivacea*. Its terms, both as to colour and markings, completely cover the description of *M. circumcincta*. There can, of course, be no reasonable doubt that the existing so-called "type" of *comis* is a specimen of *olivacea*, in which case the type label has been certainly transferred to another specimen after the type of *comis* was returned to Mr. Hy. Edwards. I do not remember that my type of *comis* was peculiarly set. The species was so much more vividly coloured that it did not even suggest to me *olivacea*, a species of which I possessed a long series.

MR. CARL F. BAKER spends most of the summer collecting in choice localities, up to 12,000 feet altitude, in the mountains of Northern Colorado. After October 1st, his address will be Auburn, Alabama, where he goes to fill the position of Entomologist in the A. and M. College.

THE COLEOPTERA OF CANADA.

BY H. F. WICKHAM, IOWA CITY, IOWA.

XVIII. THE CHRYSOMELIDÆ OF ONTARIO AND QUEBEC—(*Continued*).

TRIBE VIII.—CHRYSOMELINI.

Most of the members of this tribe are of at least moderate size, and are often quite ornately coloured. In form they are usually robust and convex, while lacking the rotundity of the Cryptocephalini. The genera of Eastern Canada may be arranged thus, the characters used being in the main drawn from the Leconte and Horn "Classification":—

- A. Anterior coxal cavities closed, metasternum long; reddish-yellow above, with black stripes. *Entomoscelis*.
- AA. Anterior coxal cavities open.
 - b. Claws simple, not toothed.
 - c. Tarsi with third joint entire or scarcely emarginate.
 - Prothorax not margined at base; species rather elongate, slightly convex, striped. *Prasocuris*.
 - Prothorax margined at base; species larger, more robust and convex.
 - Last joint of palpi truncate. *Doryphora*.
 - Last joint of palpi dilated. *Chrysomela*.
 - cc. Tarsi with third joint emarginate or bilobed.
 - Elytra spotted or spotted and striped. Prothorax with a thickened margin. *Lina*.
 - Elytra unicolorous, not spotted nor striped, except that the metallic gloss is sometimes intensified over longitudinal lines.
 - Elytra with regular punctured striæ. *Plagioderæ*.
 - Elytral punctuation dense and confused. . . . *Gastroidea*.
 - bb. Claws toothed or bifid.
 - Tibiæ dilated and toothed near the tip. Species of oblong, rather convex form; yellow with black spots. . . *Goniocтена*.
 - Tibiæ slender, neither dilated nor toothed. *Phyllodecta*.

ENTOMOSCELIS, Chev.

E. adonidis, Fabr., is about .33 in. long, less robust than most of the Chrysomelini; the upper surface of the body dark reddish-yellow; the mouth-parts, sides of head, broad median stripe (and usually small lateral spot) on thorax, suture, and broad lateral stripe on elytra, black.

Antennæ, legs, and most of the under surface, excepting the sides of the prothorax, black. It is found both in America and Europe, and has here gained an additional importance through its destructiveness to turnips, radishes, and cabbages in the Western Provinces.

PRASOCURIS, Latr.

Elongate species of less convex form than usual, upper surface striped with yellow and brassy-green or bronze-black. The three species are thus separated by Mr. Crotch:—

Each elytron with two yellow vittæ not confluent at base. .24

in.....*phellandrii*, Linn.

Yellow vittæ of elytra confluent at base.

Legs black. .18-.22 in.....*obliquata*, Lec.

Tibiæ pale (= *varipes*, Lec.). .14-.18 in.....*vittata*, Oliv.

DORYPHORA, Ill.

Contains two large species of robust and convex form and bright colours. *D. decemlineata*, Say, the "Colorado potato-beetle," is almost too well-known to need a description—its yellowish colour, with black-spotted thorax and the five black stripes (the second and third of which are united at tip) on each elytron, rendering it easily recognizable. *D. clivicolis*, Kirby, is found on milkweed, and reaches a size of from .32 to .48 in. It is of a dark blue, the elytra orange-yellow, usually with three black spots on each, arranged thus: One on the humerus, one near the apex, and one on the suture, confluent with its fellow on the opposite elytron. The spots may all become confluent laterally, thus forming two broad blue bands, or, as in the variety *Rogersii*, Lec. (which is described as having the sides of the thorax nearly parallel behind), may become very much reduced in size and break up into numerous smaller ones.

CHRYSOMELA, Linn.

The species of this genus are more numerous and usually smaller than those of *Doryphora*, to which they bear a general resemblance. They are usually taken by sweeping. I find *C. exclamationis* on *Helianthus*, while *C. elegans* is occasionally abundant on willows. The following table will enable the Canadian species to be separated without much trouble:—

A. Elytra with tolerably regular stripes, never with numerous spots.

b. Front and side margins of prothorax pale, sometimes the base also.

- c. Each elytron with more than one vitta besides the sutural one.
First vitta free from the suture for its entire length, the fourth interrupted. .28-.30 in. *exclamationis*, Fabr.
First vitta uniting with the sutural, second and third confluent towards the apex, fourth much reduced. .22-.28 in. *conjuncta*, Rog.
- cc. Each elytron with broad sutural and one lateral vitta, thorax with black or dark brown discal mark of variable size, rarely reaching the base. .20-.25 in. *elegans*, Oliv.
- bb. Thorax unicolorous, brownish, more or less bronzed. Elytra with from one to three stripes besides the sutural.
- d. Last joint of palpi very large. .24-.32 in. *lunata*, Fabr.
- dd. Last joint of palpi moderate.
Claws approximate, form more oval. .21-.26 in. *suturalis*, Fabr.
Claws not approximate, form more oblong.
.24-.30 in. *similis*, Rog.
- AA. Elytra with irregular spots, forming more or less labyrinthine patterns; sometimes coalescent, but not forming regular stripes except close to the suture.
- e. Thorax green.
- f. Elytra with spots well separated.
Suture green, first vitta coalescent with it. .28-.40 in. (Fig. 21.).. *scalaris*, Lec.
Suture not green, first vitta free. .24-.35 in. *philadelphica*, Linn.
- ff. Elytral spots coalescent, forming a reticulate pattern. .30 in. *labyrinthica*, Stal.
- ee. Thorax either entirely pale or with front margin so; elytral spots very numerous.
.26-.35 in. *multipunctata*, Say.



FIG. 21.

The variety of *multipunctata* called *Bigsbyana* by Kirby is distinguished by the large, dark basal thoracic spot. *C. spireae*, Say, is catalogued as a variety of *philadelphica*, and seems to form a link between that species and *scalaris*, since the sutural line is common and is joined to a shorter lateral one on each side near the base. An interesting paper on the group AA, by Mr. G. W. J. Angell, may be found in the first volume of "Entomologica Americana." His investigations go to show the extreme difficulty of sharply separating the species, though the majority of specimens will give no trouble in their identification.

LINA, Meg.

Two species are known from within our limits, both of them oblong insects of moderate size, less convex than *Chrysomela*. The under side of the body, the head above and a broad dorsal thoracic stripe with small lateral dot are usually black or greenish-black; the elytra, in cabinet specimens yellowish or sometimes slightly reddish with black spots. These spots, in *L. lapponica*, Linn., are rounded, or when confluent form transverse bands, while in *L. scripta*, Fabr., they are more elongate, even linear on the disc, and tend to form longitudinal vittæ. A form of *L. lapponica* in which the ground colour of the elytra is red is often found in spring on willows, sometimes mixed with the ordinary yellowish form; sometimes nearly the whole generation may be red, as is the case at Iowa City this year. *L. scripta* occurs chiefly on poplars and cottonwoods; a variety called *confluens*, by Rogers, has the elytra entirely dark except the outer margins; and a form with green elytra is mentioned by Mr. Crotch;—they may be distinguished, however, from the varieties of *lapponica* by having the claw-joint dentate. My specimens of *lapponica* range from .25 to .32 in., while *scripta* averages a little longer.

PLAGIODERA, Redt.

Oval insects of small size and green or blue colour, the upper surface convex, shining; elytra punctato-striate. I usually find them under boards in spring. Mr. Crotch thus separates the two from Canada:—

Elytral interstices finely punctulate, callus visible. .13-.17

in.....*cochleariæ*, Gyll.

Elytral interstices subrugulose, no callus. .14-.16 in...*viridis*, Melsh.

The name *cochleariæ* is replaced, in the third supplement of Henshaw's Check List, by *armoraciæ*, Linn.

GASTROIDEA, Hope.

Contains small species of oblong form, easily recognized by their resemblance to the common *G. polygoni*, Linn., so abundant on knot-grass. Following the arrangement of Mr. Crotch, they may be thus distinguished:—

Thorax and legs reddish; elytra green or blue.....*polygoni*, Linn.

Elytra golden, suture purple; thorax golden, usually purplish on edges.....*viridula*, DeG.

Blue or green, head flat, punctuation fine.....*cyanea*, Mels.

The name *viridula* replaces *formosa*, Say. All of the above are small insects, ranging from .16 to .20 inch in length.

GONIOCTENA, Redt.

G. pallida, Linn., is found on willows and poplars. It is .25 in. long, yellowish-testaceous, the top of the head and a thoracic spot of variable size (usually attaining the base) blackish. Under surface of body dark, especially towards the middle, tip of abdomen and sides of thoracic segments paler. Legs pale, elytra yellowish or reddish, occasionally nearly piceous, sometimes spotted with black, sometimes immaculate or with only a trace of the spots.

PHYLLODECTA, Kirby.

The Canadian species of *Phyllodecta* seems to be the same as the European *P. vulgatissima*, Linn. It is of oblong-ovate form, not very convex; bluish, greenish or bronzed; thorax distinctly, not very closely, punctured; elytra punctato-striate. Legs black; antennæ black, except the basal joints, which are more or less piceous or ferruginous. Length about .18 in. There are also existent records of *P. vitellina*, Linn., but no specimens have been seen by us, and Dr. Hamilton, to whom we wrote for further information, has expressed the opinion in a letter that all of the Eastern forms belong to the one species. Linnæus has described *vitellina* as being a shorter, less oblong form than *vulgatissima*. The descriptions of some of the older English writers probably confound more than one species, according to the word of Dr. Hamilton, who doubts the occurrence of the true *vitellina* in North America.

NOTES ON APHILANTHOPS AND DESCRIPTION OF A
NEW SPECIES.

BY S. N. DUNNING, HARTFORD, CONN.

Aphilanthops Bakeri, n. sp.

♂. Length, 8.5-10 mm.; of anterior wings, about 6-7 mm. Black with bright yellow markings. Head nearly quadrate, a little wider than high, closely and finely punctate. Eyes entire, elongate oval, inner margins parallel, inclined to light olive green. Ocelli in a triangle, the first a little larger than the last two, and located at the base of a slight cavity. A small cavity back and on the outer side of each of hind ocelli. Head covered with a sparse growth of long whitish pubescence, becoming thicker on face and back of eyes. Clypeus yellow and rounded, with two distinct lobes, each just inside of an imaginary line drawn straight down from base of antennæ, also a small but less distinct lobe between

these two, very slightly blackened between, and including lobes. Mandibles yellow outwardly, rufous tipped. A narrow curved yellow line just behind eyes. Sides of face yellow, same extending above base of antennæ on both sides and between. Overlapping base of mandibles is a small fringe of whitish hair. Scape of antennæ yellow-ringed at tip and below, above black, but yellow predominating. First joint flagellum, short, black, rounded, about one-third as long as second, which, with four following joints, is distinctly rufous below, and either rufous above or inclined to black; rest of antennæ black, except the rufous tip. Thorax black and covered with a sparse growth of whitish hair. Collar, sometimes spot below, tegulæ, tubercles and curved spot just back of tubercles, and a V-shaped mark below and a little back of this, transverse band on scutellum and post-scutellum, and spot on posterior lateral angles of metathorax, yellow. Mesothorax finely punctate, but not as closely so as head. When viewed from the side appears slightly ridged. Scutellum and post-scutellum rather more sparsely punctate. Metathorax with a slight rounded cavity. Abdomen black and banded with yellow; 1-6 segments each with a band, interrupted and slightly sinuose on first, either interrupted or narrowed on second and sixth, 3-5 narrowed in centre; terminal segment black, inclined to rufous at extreme tip; with a short growth of whitish hair, finely and closely punctate. First ventral either with or without a yellow spot and three or four yellow bands (growing smaller towards tip) on succeeding segments, the last band interrupted. Hind margin of first three or four segments above inclined to rufous. Legs yellow and black. Fore coxæ yellow tipped and yellow anteriorly, black posteriorly. Trochanters yellow tipped and yellow inwardly, outwardly black. Femora, first four-fifths outwardly black, rest yellow. Tibiæ yellow, with small dark spot inwardly and feebly spinose, slightly inclined to rufous at tip, as are all joints of tarsi except first, which is yellow. Middle and hind legs marked about the same, though either yellow or black may predominate on coxæ and trochanters. Wings inclined to dusky, nervures and stigma inclined to ferruginous. Marginal cell a little longer than first submarginal, appendiculate at apex. First submarginal about as long as the second and third combined on the cubital nervure, the second receiving recurrent nervure near centre, third receiving the nervure at end of first, fourth from second. Stigma with a light-coloured spot before.

Described from two male specimens belonging to Mr. Carl F. Baker

(after whom I have taken the liberty of naming this very pretty species), both from Colorado. [Baker, No. 1631 and 1636].

A. taurulus, Ckll.

A specimen which I have before me [Ckll., No. 4935, Las Cruces, N.M., ♂] differs from Mr. Cockerell's description as given in Trans. Am. Ent. Soc., XXII., p. 293, viz.: Bands on third and fourth segments distinctly separated instead of merely narrowed ventrals hold one band instead of three, and where the others should be are two very small yellow spots apiece. Middle tibiae are lemon-yellow without and rufous black within, instead of "yellow without and lemon within." Hind tibiae have first two-fifths all yellow and last three-fifths all black, and not "yellow without and black within, but wholly yellow at their proximal and wholly black at their distal ends." The sixth segment contains a small yellow dot.

A. 4-notatus, Ashm.

I have two ♂♂ before me. One from Colorado [Baker, No. 1631] and one from Montana, through the kindness of the Am. Ent. Soc. The yellow is a little brighter and more extended in the Colorado than in the Montana specimen, which has the third abdominal band separated, while in the Colorado specimen it is hardly narrowed. Mr. Ashmead's description says: "Mandibles yellow, tips black"; both of above have the yellow confined to base of mandibles, then rufous, and tips black.

A. Utahensis, Baker.

Through the kindness of Mr. Baker, I have had the type of this pretty little species for examination.

A. laticinctus, Cr.

Two males from Colorado were examined [Baker, Nos. 1631 and 1591].

A. frigidus, Sm.

Five ♀♀. Three from Hartford, Conn.; July 30th, two, and August 6th, one (1893). One from Chicago, Ill., July 31, '92, and one from Asbury Park, N. J., July 14, '93. Mr. Baker reports this from Colorado. One specimen shows no yellow on thorax, except band on collar. This was taken at Hartford, August 6th, 1893.

The above notes would tend to show that the abdominal bands are unreliable and vary greatly.

Our species may be separated as follows:

- A. Clypeus strongly tridentate, ground colour rufous throughout..... *Utahensis*, Baker.
- B. Clypeus not strongly tridentate, ground colour of at least head and thorax black.....
1. Last dorsal segment pointed, convex, legs yellow and black.
 - a. Bands of abdomen broad, continuous; clypeus yellow, size small..... *laticinctus*, Cr.
 - b. Bands, especially first three, narrow or interrupted, size larger.
 1. Clypeus face and antennæ black, except for two small yellow spots on face near base of mandibles..... *taurulus*, Ckll.
 2. Face with three broad yellow stripes, middle one shortest..... *frigidus*, Sm.
 3. Face all yellow..... *Bakeri*, Dun.
 2. Last abdominal segment rectangular and strongly concave, clypeus margined with yellow..... *4-notatus*, Ashm.

This table is Mr. Baker's, and is merely adapted to contain the new species. It was first published in CANADIAN ENTOMOLOGIST, XXVII., p. 335-6.

EXPERIMENTAL FARMS OF THE DOMINION OF CANADA.

The annual report of the Director and his assistants for the year 1895 is a goodly volume of over 400 pages, octavo, and is full of valuable and interesting matter. The portion contributed by Dr. Fletcher, the Entomologist and Botanist, contains notices of a large number of injurious insects that have attracted attention during the season in various parts of the Dominion, most of them being familiar pests. Among the less well-known insects referred to may be mentioned the "joint-worm," *Isosoma hordei*, Harris; the "cottony grass-scale," *Eriopeltis festuæ*, Fonsc.; the "cigar case-bearer," *Coleophora Fletcherella*, Fernald; the "peach bark-borer," *Phloeotribus liminaris*, Harris; the "black peach-aphis," *Aphis persicæ-niger*, Smith; the "New York plum-scale," *Lecanium cerasifex*, Fitch; and the "carrot-fly," *Psila rosæ*, Fab. The most injurious insects of the year appear to have been the grasshoppers of various species, which were excessively abundant in Ontario and the Eastern Provinces.

Dr. Fletcher includes in his report the experiments in bee-keeping carried on under his supervision at the Ottawa Farm, and closes with an account of some of the specially noxious weeds that are proving very troublesome in Manitoba and the Northwest. On the whole, we look upon this report as one of the most useful and interesting that our Dominion Entomologist has yet published.

INDEX TO THE MANTIDÆ OF NORTH AMERICA, NORTH OF MEXICO.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

In 1889, Westwood, in the Synopsis of the then known Mantidæ, prefixed to his *Revisio insectorum familiæ Mantidorum*, credits to North America, north of Mexico, nine species belonging to five genera,—Gonatista, Oligonyx, Thesprotia, Mantis, and Stagmomantis. Several species were overlooked by him, and in reality up to the present time twenty-three nominal species have been at different times credited to this region and referred to ten genera,—Ameles, Empusa, Phasmomantis, Stagmatoptera, and Theoclytes, besides the foregoing. Several of the species, however, have been erroneously credited to this country, such as *Empusa gonylodes* and *Mantis gemmata*, both of which are East Indian. Several of the names, moreover, are synonyms of others, so that the number of species these references represent is speedily reduced more than one-half. All of these but *Mantis Wheeleri* Thom., *Phasmomantis sumichrasti* Sauss., and *Oligonyx Uhleri* Stal, I have seen, and to them can add several more not before recognized in the region in question, six of them being apparently hitherto undescribed, together with one genus. The total number of species is fifteen or sixteen, and of genera, eleven, only three of the genera—Litaneutria, Stagmomantis, and Oligonyx—having more than one species; undoubtedly more forms will be found in the West and South.

The group is thus seen to be almost as poorly represented in temperate North America as the Phasmidæ [See CAN. ENT., XXVII., 29]. No species is known to occur in Canada, though a single species or two may possibly be looked for in Southern Ontario and in Assiniboia. The genera, with one exception, belong to the subfamily Mantinæ, and may be separated by the following table, largely adopted from those already given for these insects, by Stål, Bruner, and de Saussure. I add at the end a revision of the nomenclature of the described species, and a determination of the species figured by Glover.

TABLE OF THE GENERA.

- A'. Upper surface of middle and hind femora and tibiæ rounded; head unarmed (MANTINÆ).
b'. Inner margin of upper surface of fore coxæ not conspicuously dilated apically.

- c'. Pronotum but slightly longer than fore coxæ; eyes more or less conical; hind femora armed exteriorly with an apical spine.
- d'. Eyes distinctly pointed (conico-acuminate) above; hind femora delicately incrassate basally, in the ♀ nearly twice as long as the pronotum; tegmina and wings abbreviate or wanting in both sexes; cerci long, distinctly surpassing the infragenital plate *Yersinia*.
- d'. Eyes trigonal, scarcely pointed above; hind femora linear, in the ♀ but little longer than the pronotum; tegmina and wings fully developed in the ♂, abbreviate in the ♀; cerci short, not or scarcely surpassing the infragenital plate *Litaneutria*.
- c°. Pronotum much longer than fore coxæ; eyes rotundate; hind femora with no apical spine.
- d°. Antennæ filiform.
- e°. Broadest portion of pronotum far in advance of the middle, the sides in front distinctly tapering; outer margin of fore femora armed with main spines only.
- f°. Body of ♂ very elongate; anal membrane of tegmina violet *Phasmomantis*.
- f°. Body of ♂ moderately elongate; anal membrane of tegmina light coloured.
- g°. Anal and axillary veins of tegmina independent and simple throughout *Callimantis*.
- g°. Anal and axillary veins of tegmina apically confluent *Stagmomantis*.
- e°. Broadest portion of pronotum hardly in advance of the middle, the sides in front parallel or subparallel; outer margin of fore femora armed with numerous distinct spinules between the main spines.. *Gonatista*.
- d°. Antennæ incrassate beyond the base and thereafter tapering *Brunneria*.
- b°. Inner margin of upper surface of fore coxæ abruptly and considerably dilated at apex.
- c°. Fore tibiæ longer than their apical claw.

- d¹. Fore and hind sections of pronotum subequal in length *Oligonyx*.
 d². Hind section of pronotum twice as long as fore section *Bactromantis*.
 c². Fore tibiæ no longer than their apical claw *Thesprotia*.
 A². Upper surface of middle and hind femora and tibiæ carinate ; middle of head with an erect process as long as the head (VATINÆ) *Theoclytes*.

SUBFAMILY MANTINÆ.

YERSINIA Saussure.

I know of but a single and undescribed species in the United States, of which I have specimens obtained by Morrison, in Colorado, on the plains at the base of the Rocky Mountains, and by myself at Garland, Costilla Co., Colorado, at a height of about 8,000 feet. Probably it is this species which Bruner found in Western Nebraska and referred (Publ. Nebr. Acad. Sci., 1893, 22) doubtfully to *Y. mexicana*. The species, which may be called *Y. solitaria*, is slenderer and slightly smaller than *Y. mexicana*, and is apterous in both sexes.

LITANEUTRIA Saussure.

The only species of this genus heretofore known as such was described from Sonora, but we have more than one species in the West. One is *L. minor* (*Stagmatoptera minor* Scudd.), figured by Glover (Ill. N. A. Ent., Orth., pl. 13, fig. 12), and of which I have seen specimens from Texas, New Mexico, Utah, Colorado, and Nebraska. It was originally described from the ♀ only. A very small ♀, apparently of this species, from Bridger Basin, Wyoming, is in the Museum of Comp. Zoology. Bruner has also sent me specimens from Arizona, California, and Kansas, and it is probably the "Ameles sp." mentioned by him (N. A. Fauna, VII., 266) as found in New Mexico, Arizona, California, Southern Idaho, and Middle Nevada. The undescribed "Ameles borealis" of Bruner (Publ. Nebr. Acad. Sci., 1893, 22), from Northern and North-western Nebraska, of which he has kindly shown me a pair of ♀'s, is perhaps distinct from it, with smoother pronotum. Another species, closely allied to this, differing indeed only, so far as I have seen, in the far greater depth of the fuliginous mottling of the wing of the male (both have the same large sub-basal fuligino-fuscous spot, seen also in *L. ocularis* Sauss.), is apparently undescribed, and occurs in Arizona, South-

ern California and Lower California; it may be called *L. obscura*. I have also females from Utah and New Mexico which may belong to either of the above. Still another species occurs in Northern California, in the Shasta region, in which the wings are feebly and uniformly fuliginous, having no sub-basal fuligino-fuscous spot; it may be called *L. pacifica*. In all of them the front border of the tegmina is griseo-pellucid, and thus different from the Sonoran *L. ocularis*; this last species comes nearest *L. minor*. The males in this genus are fully winged, the females brachypterous and of a very different appearance.

PHASMOMANTIS SAUSSURE.

P. sumichrasti Sauss., a Mexican species, is reported by Saussure and Zehntner (Biol. Centr. Amer., Orth., 149) as found in Texas. I have seen no specimen of the genus from the United States.

CALLIMANTIS STÅL.

I place in this genus a single species which differs considerably from the type, *C. antillarum* (Sauss.), in general livery and in lacking any apical spine to the hind femora. It is an undescribed species from Florida, a trifle smaller than *C. antillarum* and closely resembling a miniature *Stagmomantis carolina*. It may be called *C. floridana*. I have only seen the male, which was probably green in life, but is now uniformly testaceous, the tegmina hyaline, without stigma, the costal margin like the rest, and the first ulnar branch completely simple; the wings are hyaline, but are rather sparsely tessellate with fuscous in their posterior third, and the ulnar vein is simple; the proportions and general shape of the pronotum are those of *Stagm. carolina*, and, as there, it is unarmed; the anterior upper margin of the fore coxæ is armed with slight, distant spines, and the hind femora and tibiæ are tipped apically with fuscous. The expanse of the tegmina is 45 mm.

STAGMOMANTIS SAUSSURE.

Of this genus I can recognize but two species, *T. carolina* (Linn.) and *S. limbata* (Hahn), readily distinguished by the great and uniform width of the costal field of the tegmina in the ♀ of the latter, where it is nearly one-third the entire width of the tegmina, and the green colour and opacity of the same field in the ♂. The former species is strongly dimorphic in the ♀, one form (*carolina*) having the tegmina strongly mottled with fuscous and the wings strongly fuliginous throughout, with a deep patch at the apex; the other (*dimidiata*), which is generally

classed as a distinct species, is entirely green, but with the posterior half of the wings sometimes strongly infuscated in the cells. As occurring in the United States, I do not see how the two forms can be specifically separated, as there are no similar distinctions in the very variable male, which is never green, but in which the tegmina may be wholly hyaline except along the costal margin, or they may be flecked with fuscous, or wholly suffused with fuliginous, while the wings vary from wholly hyaline to wholly fuliginous, with a tendency to a greater amount of fuliginous posteriorly. In some specimens from Las Cruces, N. Mex., the base of the wings is feebly violet. The species appears to be even more variable in Mexico, and the South American forms referred to *dimidiata* seem also to belong here. In the United States it is found (both forms indiscriminately) along the entire southern tier of States and territories from Florida to Arizona (Ft. Buchanan, south of Tucson, and Ft. Whipple, near Prescott), but I have neither seen nor heard of specimens from the Pacific Coast proper. From here it ranges north to Maryland, southern Illinois, Missouri, Kansas, and Utah, to judge from specimens seen by me. It is also reported from New Jersey [Smith], Pennsylvania [Westwood], Kentucky [Garman], and Nebraska [Bruner]. Saussure credits it to Cuba and Bolivar, accordingly, places it in the Cuban list, but says it does not exist in the Gundlach collection. On the other hand, I have received it from Gundlach under the number 46. It is also found at Key West. It is in the highest degree probable that Thomas's *Mantis Wheeleri* belongs to this species and probably to the form named *tolteca* by Saussure, which Saussure and Zehntner have separated as a distinct species. It seems to me rather a geographical race.

S. limbata (*viridimargo* and *cellularis* Burm.; *longipennis* Sauss.) has never been reported from the United States, but is found on our extreme Southern borders, as I have seen specimens taken at Matamoras, Mex., just over the border, on the Rio Grande; from the old Ringgold Barracks, on the lower Rio Grande [Schott]; an unspecified point in Texas, Schaupp [Henshaw]; Arizona, Morrison [Henshaw]; and Las Cruces, N. Mex. [Cockerell].

GONATISTA Saussure.

We have a single species of this genus in the United States, *G. grisea* (Fabr.), which has many synonyms. It occurs in Cuba and San Domingo, and rarely in the Eastern United States, where it is probably an interloper. I have specimens from Key West and Fernandina, Fla., and from Georgia, and recently Mr. Blatchley sent me a specimen taken in Indiana. It was figured by Glover (pl. 16, figs. 13-15) as from Florida.

BRUNNERIA Saussure.

A single female specimen of this genus, remarkable for its peculiar antennæ, is in my collection, collected by Aaron on the Gulf Coast of Texas. It is distinct from the species heretofore described, all four of which come from S. America, the genus being unknown in Mexico and Central America. It may be called *B. borealis*. It is completely apterous, very elongate and slender, greenish with a ferruginous tinge which is predominant on the thorax; the antennæ, pallid at base, are pale ferruginous in the swollen portion, growing luteous beyond; the posterior part of the pronotum is three times as long as the anterior and is rather distinctly beaded with tubercles or blunt spinules along its lateral margins; the supra-anal plate is sublanceolate, much longer than its basal breadth, and the cerci slender, delicately tapering, about half as long as the fore femora. Length of body about 50 mm.; of antennæ about 12 mm. This specimen is doubtless immature, for a second, much larger, mature specimen from Texas, obtained by A. Agassiz, is in the Museum of Comp. Zoology. It has short and broad tegmina, reaching only the middle of the metanotum, and the body is 88 mm. long.

OLIGONYX Saussure.

Three species belonging to this genus, as latterly restricted, have been described from the United States: *O. Scudderi* Sauss., from Georgia; *O. Uhleri* Stål, from Louisiana; and *O. bollianus* Sauss. Zehntn., from Texas and Northern Mexico. The first has also been credited, by Stål, to Texas, and is figured under this name by Glover (Ill. N. A. Ent., Orth., pl. 16, fig. 11, ♀), and as *Mantis missouriensis* Riley, by the same (Ibid., pl. 13, fig. 11, ♂). Whether these nominal species are distinct from one another I have not now sufficient means of deciding. *O. Scudderi*, though labelled as coming from Georgia, was originally thought by Saussure to really come from Central America, but he is now evidently of a different opinion, as it is not included in the Biologia Centrali-Americana. I have a specimen from Carolina which agrees with his description of *O. Scudderi*, and an immature specimen, apparently of this genus and about 6 mm. long, was found with others running about in a house in Water-ville, N. Y., and sent to Mr. J. A. Lintner with enquiries. It proved to have probably hatched from eggs accidentally sent in the "moss" (*Usnea*) used in packing a barrel of oranges from Florida. So the genus occurs in the South-eastern States. My Carolina specimen is a trifle

stouter than numerous specimens from Texas (Boll, Belfrage, Lincecum), which altogether agree with *O. bollianus*, as do specimens sent me from Lincoln, Nebr., by Bruner, as *Mantis missouriensis*. I am therefore inclined to believe these two supposed species to be identical, and probably distinct from Stål's darker *O. Uhleri*, which I have not seen.

BACTROMANTIS (*βάκτρον*, Mantis), gen. nov.

Closely allied to *Oligonyx*, and, indeed, equivalent to the second division of that genus by Stål (Bihang K. Svensk. Akad. Handl., iv., No. 10, 67), to which he refers an unnamed species from Mexico. It comprises those species hitherto placed in *Oligonyx* (Stål, emend.) as have a very elongate instead of abbreviate pronotum, in which the hinder section is fully twice as long as the fore section. To it belongs only a single species from the United States, which may be called *B. virga* (possibly the species given in Westwood's Synopsis as *Thesprotia baculina* Bates MS., from Eastern Florida may be the same). I have only seen the apterous female; it is testaceous, the fore femora obscurely and narrowly banded with fuscous, the other legs greenish yellow; the apex of the femora broadly, the base and apex of the tibiæ narrowly, infuscated. Length of body, 43 mm.; of pronotum, 15 mm. Sandford, Fla.; collected by Frazer.

THESPROTIA Stål.

We have a single species of this genus, *T. graminis*, named by Bates and described by me many years ago as an *Oligonyx*. I described only the ♂; the ♀ is apterous. It occurs in Florida, from Key West northward, and in Georgia.

SUBFAMILY VATINÆ.

THEOCLYTES Serville.

I here follow Saussure rather than Stål in restricting Serville's genus to his first subdivision, or what Serville at the outset terms *Theoclytes propriè dicta*. The only species known in the United States is *T. chlorophæa* (Blanch.), which occurs throughout Mexico, and is said to extend, says Saussure, to the United States as far as New York. It was originally described from Watertown, N. Y., but has since been recorded only from Central America, Mexico, and Louisiana. Saussure remarks that it probably does not extend northward beyond the Southern States. This seems altogether probable. The only specimen I possess comes from just over the Texan border at Matamoras.

Revision of the Nomenclature.

Ameles borealis Brun., Publ. Nebr. Acad. Sc., 1893, 22 = *Litaneura borealis*.

Ameles mexicana Brun., Ibid., 1893, 22 = *Yersinia solitaria*?

" sp., Brun., N. A. Fauna, vii., 266 (1893) = *Litaneura minor*.

Empusa chlorophæa Blanch., Hist. Nat. Ins., iii., 2 (1840) = *Theoclytes chlorophæa*.

Empusa gongylodes Westw., Drury's Ins., i., 122 (1837), East Indian.

Gonatista grisea Sauss., Mant. Amer., 23 (1871) = *Gonatista grisea*.

Mantis carolina Linn., Syst. Nat., Ed. 12, ii., 691 (1767) = *Stagmomantis carolina*.

Mantis chlorophæa Blanch., Mag. Zool., v., 135 (1835) = *Theoclytes chlorophæa*.

Mantis conspurcata Serv., Orth., 190 (1839) = *Stagmomantis carolina*, ♂.

Mantis ferox Sauss., Rev. Mag. Zool., 1859, 60 = *Stagmomantis carolina*.

Mantis gemmata Stoll', Spectres 71 (1787), East Indian.

" gongylodes Drury, Ill., i., 129 (1770), East Indian.

" grisea Fabr., Ent. Syst., ii., 20 (1793) = *Gonatista grisea*.

" inquinata Serv., Orth., 191 (1839) = *Stagmomantis carolina*.

Mantis missouriensis Riley, Glou., Ill. N. A. Ent., Orth., pl. 13, fig. 11 (1872) = *Oligonyx Scudderi*.

Mantis phryganoides Serv., Orth., 198 (1839) = *Gonatista grisea*.

Mantis Wheeleri Thom., Rep. Geol. Surv. 100th mer., v., 849 (1875) = *Stagmomantis carolina*?

Oligonyx bollianus Sauss.-Zehntn., Biol. Centr. Amer., Orth., 173 pl. 9, fig. 17 (1894) = *Oligonyx Scudderi*.

Oligonyx graminis Bates, Scudd., Proc. Bost. Soc. Nat. Hist., xix., 90 (1877) = *Thesprotia graminis*.

Oligonyx Scudderi Sauss., Mant. Amer., 121, pl. 2, fig. 24, 24a (1871) = *Oligonyx Scudderi*.

Oligonyx Uhleri Stål, Bih. K. Svensk. Akad. Handl., iv., No. 10, 66 (1877) = *Oligonyx Uhleri*.

Phasmomantis carolina Brun., Bull. Washb. Coll., i., 125 (1885) = *Stagmomantis carolina*.

Phasmomantis sumichrasti Sauss.-Zehntn., Biol. Centr. Amer., Orth., 149 (1894) = *Phasmomantis sumichrasti*.

- Pseudovates chlorophæa* Westw., Rev. Mant., 24 (1889) = *Theoclytes chlorophæa*.
- Stagmatoptera minor* Scudd., Rep. Geol. Surv. Nebr., 251 (1872) = *Litaneura minor*.
- Stagmomantis carolina* Sauss., Mant. Amer., 46 (1871) = *Stagmomantis carolina*.
- Stagmomantis dimidiata* Sauss., Ibid., 48 (1871) = *Stagmomantis carolina*.
- Stagmomantis minor* Sauss., Ibid., 54 (1871) = *Litaneura minor*.
- Stagmomantis tolteca* Sauss.-Zehntn., Biol. Centr. Amer., Orth., 143 (1894) = *Stagmomantis carolina*.
- Theoclytes chlorophæa* Serv., Orth., 153 (1839) = *Theoclytes chlorophæa*.
- Thesprotia baculina* Bates, Westw., Rev. Mant., 5 (1889) = *Bactromantis virgo*?

Explanation of the figures of Mantidæ

on the plates of Glover's Illustrations of N. A. Entomology, Orthoptera :—

Pl. 2. *Stagmomantis carolina* (Linn.).

Pl. 12, fig. 16. No name or locality is given ; it probably does not come from the United States.

Pl. 13, fig. 11. *Oligonyx Scudderi* Sauss., ♂.

fig. 12. *Litaneura minor* (Scudd.), ♀.

Pl. 16, fig. 11. *Oligonyx Scudderi* Sauss., ♀.

fig. 13. *Gonatista grisea* (Fabr.), pupa.

fig. 14. " " ♀.

fig. 14a. " " ootheca.

fig. 14b. " " larva.

fig. 15. " " ♂.

A VARIETY OF *HEPIALUS ARGENTEO-MACULATUS*.

BY E. F. HEATH, "THE HERMITAGE," CARTWRIGHT, MANITOBA.

When Mr. Fletcher was looking over my cases of moths during the short visit he paid me last summer, he particularly noticed a series of *Hepialus argenteo-maculatus*, and suggested that a short description of a variety that I have taken here would be interesting.

This variety differs so much from the normal type that it might almost be a distinct species, but that is a point I cannot pretend to determine.

The ordinary specimens I have taken here measure from $3\frac{1}{4}$ to $3\frac{1}{2}$ inches across the expanded wing, but this variety only averages about 2 inches. The ground colour of the fore wings in the case of one female is almost white, with markings similar in pattern to those of the large variety, faintly outlined in greenish-brown; the wings are also rather more pointed than in the normal type. The hind wings are smoke-coloured, as are also the thorax and abdomen. In another specimen, a male, the fore wings are white with a slight shade of salmon colour, without any markings whatever; the hind wings are a shade or two darker, and the thorax and abdomen correspond in colour to the wings adjacent to them.

The habits of both varieties are very similar. I have taken both flying with their peculiar oscillating flight over low cherry scrub, or just on the verge of higher patches. It is a very curious sight to see several of these large moths performing their oscillations for several minutes over the same spot soon after sunset in the early summer—July; the flight being very rapid.

Here I believe the larva to feed upon both the wild black and red cherry, for I have once or twice shaken the pupa out of the roots of cherry scrub when digging some scrubby ground for a garden. I remember being much struck by the locomotive powers of one that I laid aside for a few minutes, and which managed to wriggle a considerable distance, comparatively, in a short space of time.

NOTE ON EUTOLYPE ELECTILIS.

BY A. RADCLIFFE GROTE, A.M., HILDESHEIM.

Prof. Roland Thaxter has sent me a specimen of what may be *E. electilis*, Morrison, and says: "The *Eutolype* is, as I suppose, *electilis*, and is subject to very great variation as to the depth and disposition of the darker shades and the clearness of the maculation, some being more or less obliterate and others on the plan of *Coelodasys biguttatus*, var. *cinereofrons*." This is the first specimen I have had, and I can only say it represents a species distinct from *Rolandi* or *depilis*. Unfortunately, the abdomen is missing, and I cannot say if it is tufted. The black dash described by Morrison is incomplete. I saw the type in the Tepper collection, but had no opportunity of comparing it with the others. It reminded me, on a very cursory examination, of *muralis*, but as all the species have the peculiar facies of the group, this comparison goes for

nothing. In my Bremen List I suggest the identity of *bombyciformis*, Sm., with *electilis*, and this, considering what Prof. Thaxter says of the variability of *electilis*, may prove to be the case. The two descriptions do not contradict essentially. On page 59 of his paper, Prof. Smith says: "I do not know where Morrison's type is to be found." On page 57 he says: "There is a badly-rubbed specimen, I believe in the Tepper collection marked 'type' by Mr. Morrison, in which the basal dash is broad and suffused; but I did not otherwise compare it with the description." I may ask why this specimen is not Morrison's type, since all other types in coll. Tepper are pronounced without doubt to be "the type"? With such a variable species as *electilis* evidently is, I cannot do more than suggest that Morrison's type be looked up by Prof. Smith. This type must be still in the Tepper collection, from which Prof. Smith has again had types only recently in working the *Hypenine*. To have this matter cleared up would be a great help, as "*electilis*" is cumbering our lists without being positively applied to any species in the collections.

JOHN B. LEMBERT.

The tidings of the tragic death of "the Entomologist of the Yosemite," as he was locally called, was a great shock to his many correspondents. On the 19th of April last, a passing Indian found the body of Mr. Lemberth lying dead in his cabin, with a large bullet-hole in his head, over the right temple. He had evidently been murdered, as the cabin was found locked on the outside with a padlock. The crime is supposed to have been the work of some Indian whom he had offended, as he had no money or other valuables. From the condition of the body it was considered that the murder had been committed about the first of April.

Mr. Lemberth was a native of New York, but had lived for many years among the mountains of California. He owned a bit of land at the headquarters of the Tolumne River, at an altitude of 9,000 feet, and lived there like a hermit till his property was included in the Yosemite Park. As he wrote me last year, he then lost his home and was "shut out of making a living from the stockmen. Mr. Dyar came along like an angel unawares, and, at the age of fifty-one, he commenced to collect insects, having been living in the sight of nature continuously for twenty years." He occasionally acted as guide to parties visiting the mountains, and in this way made the acquaintance of Mr. Dyar, who in-

terested him in entomology, and taught him how to observe and collect. This was in 1891. He was, therefore, 56 years of age at the time of his death, though supposed to be a very much older man. He succeeded in collecting a number of rare species, and made many careful observations on the life habits of these and others, some of which have been published in this and other entomological magazines. The last time I heard from him was in February, when he sent me some specimens and a note on the preparatory stages of *Arctia virginalis*. His untimely death is a loss to entomology, as he was a keen observer and diligent collector in a little-known locality, and had only just begun a work which would have been of great value. He lived all alone among the mountains, and has left neither wife nor child to mourn his departure. C. J. S. B.

COLIAS CÆSONIA.—In our last issue the capture of this butterfly at Toronto was recorded. Mr. James Walker, of Orillia, Ont., writes: "I saw numbers of *Colias Cæsonia* flying over a clover field to-day (July 13th). I captured four, two of which were perfect. I had only liberty to walk on the edge of the field, or I might have been more successful. Mr. Grant has also captured five or six."

Mr. E. F. Heath writes, from Cartwright, Manitoba: "On June 19th I captured a rather worn specimen of *C. Cæsonia*. A few days subsequently I had a distant view of what I took to be another example. On July 10th I chased, but did not succeed in capturing, a fresh-looking specimen, and on the 15th was fortunate enough to take a very good one. I have since seen one or two more. It is not very easy of capture when assisted by a prairie breeze. This is the first time I have noticed the butterfly during a residence in the country of sixteen years."

LIBYTHEA BACHMANI.—Mr. McDonough captured a specimen east of Toronto, in 1895, and one in his garden in the city on the 7th of June last. The only previous Canadian records are Port Stanley, London and Hamilton.

THECLA SHERIDANI.—No less than fifteen specimens of this extremely rare butterfly were taken in the foothills west of Fort Collins, Colorado, at the end of April, by Professor Gillette, of the State Agricultural College, Fort Collins, and Mr. S. T. Mason, of Denver, Colorado.

Mailed August 1st.

The Canadian Entomologist.

VOL. XXVIII. LONDON, SEPTEMBER, 1896.

No. 9.

A HOUSE-INFESTING SPRING-TAIL

(*Lepidocyrtus americanus*, n. sp.).

BY C. L. MARLATT, WASHINGTON, D. C.



FIG. 22—*Lepidocyrtus americanus*, n. sp.

a, lateral view of female; *b*, foot; *c*, tip of spring; *d*, scale; *e*, labrum;
f, mandibles; *g*, maxillæ and labium (original).

In the course of a comprehensive study of insects frequenting dwellings, attention was early drawn to a very handsome little Collembolan, which occurs commonly in moist situations in houses in Washington. It may often be found on window-sills, especially if there is unusual moisture from the presence of window plants, or in bathrooms, and, in fact, wherever moist conditions prevail. This species is a very handsome one, and seems, from reference to the authorities, to be undescribed. From the manner of its holding the head, bent downwards almost at right-angles to the thorax, it would seem to fall into the genus *Lepidocyrtus*, erected by Sir John Lubbock. In habit it has in Europe a close ally in *Seira domestica*, Nicolet, which, as its name implies, is a frequenter of houses, and is separated generically from *Lepidocyrtus* by rather unimportant characters. Before referring to this insect in a popular article, it seems desirable to have a technical description put on record, and the following characterization of the species has therefore been prepared:—

Lepidocyrtus americanus, n. sp.

Length, 1.5 mm.; with spring unfolded above 2 mm.; head bent strongly downward, as in *L. curvicolis*, Lubbock; antennæ 4-jointed, more than one-half length of body; basal joint not much more than one-half length of others, which are subequal; abdomen with four segments, the third of which equals one-third length of body; legs tapering, with minute terminal tarsal joint; armed at apex with large spur, notched at tip and below, which is a strong simple spur or spine; spring more than half length of body, jointed at centre, the apical portion bifurcated; densely clothed with long fine hairs; terminal rays very finely and regularly comb-notched on lower or posterior edge and somewhat curved downward at tip, with three or four short, rather distinct, teeth at extreme tip; catch a strong groove or sheath extending one-third length of venter of abdomen and grasping spring strongly up to middle joint; body clothed with flat striate scales, and dorsally with scattering heavy, almost clubbed, hairs; the anterior margin of pronotum is ornamented with very dense tuft or fringe of strong hairs; hairs of antennæ and legs for the most part fine and long. Colour silvery gray, marked with violet-purple, lighter on antennæ and legs and very dark on body markings; eyes black; antennæ, except base of lower joints, femora and tibiæ, with spot connecting antennæ, light purple; anterior and lateral margins of thorax, spots along side of body, hind margin of second, third and fourth abdominal segments, lateral spot on middle of third segment, dark purple, sometimes appearing almost black. *

One-third and one-half grown specimens do not differ from adult notably, except in size and very slightly in coloration. The illustration which is presented herewith is sufficiently elucidated in the accompanying explanation. In the figure the head is bent up more than in its normal position in state of rest. The mouthparts are very difficult to work out. The labrum is simple. The right and left mandibles differ notably in the character of the teeth on their inner edges. The maxillæ and labium are of similar structure, consisting of large basal lobes, apically covered with long and rather dense brushes of hairs. The food of the insect, from the appearance of the alimentary canal, consists of particles of dust, possibly taken by the insect in its feeding on the moist vegetable moulds of decay which may be assumed to be its normal food, in the absence of any other evident material on which it could subsist.

STILL ANOTHER APHILANTHOPS.

BY T. D. A. COCKERELL, MESILLA, NEW MEXICO.

Aphilanthops concinnulus, n. sp. — ♀. Length, 9 mm. Rufous, with white markings, a rather obscure broad black band extending across vertex, including most of the ocelli, its lower margin concave, mandibles darkened towards tips, mid and hind tarsi darkened. The white or yellowish-white marks consist of a small spot on each lower corner of face, a small obscure suffused spot on mandibles near base, the prothorax above, the tegulae except extreme base, the tubercles, a large patch behind tubercles having a linear oblique projection above, the anterior margin of scutellum, a spot on each side, the postscutellum, spots at the apices of anterior and hind femora, longitudinal bands on all the tibiae, a large patch on each side of the first three abdominal segments, a band on the fourth, a broad quadrate spot medially on the fifth. Venter immaculate. Face with the usual silvery appressed pile. General structure, wings, etc., as in *quadrinotatus*, but the third submarginal cell is much less produced at its apex, and the third at its base, than in *quadrinotatus*, this character, however, being liable to variation. The anterior tarsi present numerous gray spatulate hairs. The apex of the abdomen is of the same type as in *quadrinotatus*.

♂. Length, 8 mm. Black with white markings; the legs, the first segment of the abdomen, the second and sometimes the third more or less dorsally, the sides of the prothorax and greater part of metathorax sometimes, dark rufous. Markings as in ♀, except that the clypeus is yellowish-white, the anterior and middle femora have a white subapical patch behind, the abdomen above has five continuous bands, the second and third sometimes narrowly interrupted, the venter has three white bands, interrupted in the middle. Apex of abdomen pointed. Scape dark rufous with a pale yellowish ring. Face densely covered with silvery pile. Clypeus (if the light portion wholly coincides with it) very low and broad, with a median lobe extending upwards; it is probable, however, that the sides of the clypeus above are dark. Anterior margin of clypeus with three very distinct, but small, teeth. A brush of yellowish hairs in front of each mandible at its base. Mandibles rufous, with a light spot at base, simple. Punctuation of vertex much closer than in *taurulus*. Nervures and stigma piceous or black.

Hab.—Several of both sexes, Rincon, New Mexico, July 5, visiting the flowers of *Chilopsis saligna*, Don. (Bignoniaceae), in the river bed. One *A. taurulus* was taken with them.

I am convinced that these are the sexes of one species, but the ♂ and ♀ would come at opposite ends of Mr. Dunning's table (CAN. ENT., XXVIII, 206). The males known from North America, with three teeth on the anterior edge of the clypeus, may be separated thus:—

- (1.) Ground colour rufous. *utahensis*, Baker.
- (2.) Ground colour black.
 - (a.) Head and thorax densely hairy. . . *hispidus*, Fox (L. Cala.).
 - (b.) Head and thorax not unusually hairy. . . *concinnulus*, Ckll.

The female of *concinnulus* is smaller than *quadrinotatus*, and has not the black head and thorax.

NEW COCCIDÆ FROM MASSACHUSETTS AND NEW MEXICO.

BY T. D. A. COCKERELL, MESILLA, N. M.

In Europe and in New Zealand species of the genus *Ripersia* have been found, which lived in the nests of certain ants. It had always seemed to me singular that nothing of the kind should occur in this country; but Mr. G. B. King has proved that they merely wanted looking for, his researches in Massachusetts having led to the discovery of three species, here briefly described.

(1.) *Ripersia Kingii*, n. sp.—♀. About $1\frac{1}{2}$ mm. long, oval, legs and antennæ very pale yellowish; the natural colour of the insect could not be determined from the alcoholic specimens, but Mr. King states that when alive it is pink, shading into purple. Mentum (so-called) elongate, dimerous, with four bristles in a group at each side near the tip, and two on the sides further up, at considerable intervals. Antennæ fairly stout, 6-jointed: 6 much longest, and about as long as 3, 4 and 5 together. Formula 6 (21) (534). All with very sparse whorls of hairs. 6 with 3 whorls. Femur stout, with four bristles on its outer margin. Tibia a little shorter than femur, with four long bristles on outer margin and two on inner. Tarsus distinctly longer than tibia. Claw very long, sharp, not much curved. Digitules very inconspicuous, filiform, with very minute knobs. Anal ring with 6 moderately small hairs. Caudal tubercles low, scarcely developed, with several hairs like those of the anal ring. Dermis with very few short hairs. Antennæ about as far apart as the length of a femur.

Hab.—Dracot, Mass., April 14, 1896, with *Lasius flavus*, L., very abundant [G. B. King]. From the character of the legs, I think these specimens are only of the second stage, but in any event the species

seems quite distinct. Another lot, also from Dracot, April 20, 1895, "with *Lasius claviger*, Rog., and *L. flavus*, very common," presents no structural differences, though Mr. King gives the colour when alive as purple. A third lot, "with *Lasius claviger* and *L. flavus*, Lawrence, Mass., April 10, 1894, colour purple," also agrees with *R. Kingii*; but one specimen of this lot has the antennal formula 631 (245), 6 with only two whorls of hairs, and may represent another species. Another has the formula 63 (21) (54).

(2.) *Ripersia lasii*, n. sp.—♀. Small, elongate-oval, clear white when alive (as I learn from Mr. King); legs ordinary, rather slender; tibia slender at base, almost as long as femur, but only about half as thick; tarsus about two-thirds length of tibia; claw rather long, pointed, slender; tibia and tarsus each with three short bristles on inner side. Trochanteric bristle not very long. Mentum dimerous, three hairs on each side near tip. Digitules apparently absent. Antennæ 7-jointed: 7 longest, longer than 5+6, but not quite as long as 4+5+6; 2 next longest; 3, 4 and 6 subequal; 5 shortest, a very little broader than long. Joints with very sparse whorls of hairs: 7 with three whorls, 7 a little constricted about the beginning of its apical third. Another specimen has only 6-jointed antennæ, varying thus like the European *R. pulveraria*: 3 is almost as long as 6. Formula 6 (31) 254. Four is as broad as long. As in *pulveraria*, the third joint divides to make the 7 joints. The joints are more constricted at the sutures than in *pulveraria* as figured by Newstead.

From *R. Kingii* it differs by the narrower third joint of antennæ, the somewhat less tapering apical joint, the more slender tibia and tarsus, the tarsus less tapering to claw, the claw less curved, femur not so stout, tarsal hairs shorter, stronger, not so curved, mentum shorter in proportion to its length, legs rather brownish than yellowish.

Hab.—Methuen, Mass., June 17, 1896, with *Lasius americanus*, Em., not common [G. B. King]. Another lot is marked by Mr. King, "with *Lasius flavus*, L., Methuen, Mass., Oct. 10, 1894, colour clear white, not very common." This is, I think, certainly the second stage of *R. lasii*, and may be described thus: Very slightly over 1 mm. long, rather elongate-cylindrical, though not excessively so; legs quite large; femur fairly stout, but not so stout as in adult; tibiæ somewhat shorter than tarsi. Antennæ 6-jointed: 6 about as long as 3+4+5, but not so long as in the adult. Formula 63 (21) (54). This second stage may be

known from *Kingii* by the third joint of the antennæ being distinctly longer than the second, as well as by the quite different colour when alive.

(3.) *Ripersia flaveola*, n. sp.—♀. Rather slender, about $1\frac{1}{2}$ mm. long, colour about a light French yellow when alive (Mr. King informs me); antennæ slender, 6-jointed: 6 longest, a little longer than 4 + 5; 2, 3 and 4 subequal, 4 a little the shorter, but quite remarkably long, fully twice as long as broad; 1 next longest, then 5, which is a third longer than broad; 3 has a deep constriction at its distal third, so that it looks as if there were 7 joints, with a very small 4th, broader than long; 6 with three whorls of hairs. Legs slender, except femur, which is fairly stout. Tibia about as long as femur, tarsus about two-thirds length of tibia. Claw rather long, fairly stout, not much curved, with a small sub-basal tubercle on its inner side. Digitules apparently wanting. Mentum rather short, ordinary.

Another shows 7-jointed antennæ: 4 dividing into two, so we have 4, 5 and 6 all short and equal, or about so, 5 a little the shorter. This differs from 7-jointed *R. lasii* in being longer and slenderer, the sutures between the joints nearly flat for the most part, 6 much narrower, 2 and 3 longer, especially 2, which is at least twice as long as broad.

Hab.—Methuen, Mass., April 18, 1896, with *Lasius claviger*, Rog., not common [G. B. King]. Differs at once from *R. Tomlinii* by the antennæ; it is smaller than *R. corynephari*.

(4.) *Dactylopius prosopidis*, n. sp.—♀. Oval, about 2 mm. long, pale gray, varying to dark slate-gray and pale brownish-gray, with a sparse mealy covering, which is most dense along back and at sides, leaving fairly well-defined broad subdorsal bands of a somewhat darker colour, due not to pigment, but to the exposure of the body. No caudal or lateral cottony filaments, except in half-grown individuals, which show six short cottony caudal tufts.

The females live in subspherical masses on the twigs, after the fashion of *D. filamentosus*, and are attended by ants. The ♀ forms a dense cushion of white cottony matter, on which it rests; this cushion is visible all round the margin of the insect, and does not at first protrude greatly behind. In it are laid the very pale greenish-yellow eggs. Eventually the females become dark slate-gray, and have a cross of white secretion on the hind end. They at this period possess a *Pulvinaria*-like ovisac, projecting behind about as much as the length of a ♀, but thick, its height at the hind extremity of the ♀ being probably not less than the length of the ♀.

Boiled in caustic soda, they stain the fluid cochineal-red, and turn orange. Anal ring with the usual 6 hairs. Caudal tubercles very low, subobsolete, with setæ which are about twice as long as the hairs of the anal ring in the second stage, but not so long as this in the adult. Antennæ 8-jointed: 8 much longest, as long as $5 + 6 + 7$, which are subequal, but 5 the shorter; 4 shortest, broader than long; 3 and 2 equal. Formula 8 (32) 7 (61) 54. Legs ordinary, tarsus about $\frac{5}{8}$ to $\frac{7}{8}$ length of tibia, claw fairly large, digitules filiform, hardly knobbed.

Hab.—In the town of Mesilla, N. M., on Mesquite (*Prosopis*). I was astonished to come across this on some bushes I had passed many times. I have never seen it before on the numbers of Mesquite bushes I have examined in the vicinity. The eggs are produced at the latter part of July. This insect, in structure, particularly in the antennæ, closely resembles *D. solani*, var. *atriplicis*, which is probably a distinct species. Perhaps *prosopidis* and *atriplicis* may be forms of one species, but they seem distinct.

(5.) *Pulvinaria amygdali*, n. sp.—♀. Ochraceous, much wrinkled in drying; length of a boiled specimen under cover-glass hardly $2\frac{1}{2}$ mm., broad oval. Ovisac about 7 mm. long, pure white, convex, like that of *P. ribesiae*, not parallel-sided like *camellicola*, etc., nor adherent to anything that touches it, like *macluræ*, *innumerabilis*, etc.

Antennæ 8-jointed: 3 much longest, then 4, then 8 almost as long, 2 very little longer than 5; 6 and 7 subequal and shortest, 6 a little the shorter; 5 with two long bristles; 2 with a long hair at its end. Trochanter with a very long hair. Femur stout, more than twice as broad as tibia, with an erect hair on its inner side near the middle. Tibia and tarsus slender, tibia about as long as femur, tarsus hardly half as long as tibia. Claw short and curved, sharp. Tarsal digitules slender; those of claw tolerably stout, with oblique knobs, extending considerably beyond tip of claw. Marginal spines simple, slender, not numerous.

Prof. Tinsley, who was looking over the material with me, observed a specimen in which the third and fourth antennal joints were about equal.

Hab.—Abundant on a peach tree in Mr. Stanley's garden at Pinos Altos, N. M. (over 7,000 ft. alt.); found only on one tree. The antennæ are much like those of *P. persicæ*, Newst., but *amygdali* has the eighth joint decidedly longer. The knobs of the claw-digitules are larger and more oblique than in *persicæ*, and our insect is much smaller than Newstead's. The affinity of *amygdali* is clearly with *P. ribesiae*, Sign.,

but I have specimens of that, and it is clearly a different thing; the scale is dark-coloured. I do not suppose that *P. amygdali* was introduced into Pinos Altos on trees, but rather that it lives on some rosaceous shrub or tree in the mountains adjacent and has been carried to the peach tree on the feet of birds. This idea is favoured by the observation that it suffers severely from a Chalcidid parasite. The insect was discovered on July 8, 1896.

(6.) *Aulacaspsis montanus*, n. sp.—♀. Scale circular to slightly oval, slightly convex, white, exuviae exposed, rather large, pale straw-yellow, first skin on second, but to its side. Diameter of scale little over 1 mm.

♀. When dry, brown-black, colourless after boiling in caustic soda. Mouthparts far anterior. Five groups of ventral glands, caudolateral and median groups compact, caudolaterals of 8, cephalolaterals 13, median 7. Median lobes wide apart at base, rounded, very low, their height above the margin less than half their breadth, their bases pointed, their colour slightly yellowish, not dark. Second and third lobes small, rounded, nearly obsolete. Plates small, spinelike. Anal orifice some distance from hind end, but caudad of the level of the caudolateral grouped glands. Margin with narrow sacs or saclike incisions, about as long as the greatest breadth of a median lobe.

♂. Scales in colonies, much as in *A. texensis*, brownish-white, distinctly 3-carinate, exuviae at one end, pale orange.

Hab.—Pinos Altos, N. M., July 8, 1896, on the trunk and limbs of *Quercus Wrightii*. It is evidently nearest to *A. texensis*, which lives on *Sophora* in Texas, but the median lobes are differently shaped and do not show the prominent serrations. The ♂ scales are not so white and have sharper keels than in *texensis*, but the ♀ scales are whiter and have the exuviae more contrasting with the scale.

I found four species of Coccidæ on the *Quercus Wrightii* at Pinos Altos, namely: *Aulacaspsis montanus*, n. sp.; *Aspidiotus ancylus*, Putnam (evidently native); *Kermes galliformis*, Riley; and *Olliffiella cristicola*, Ckll., ined. The last is an extraordinary gall-making species, the type of a new genus of Idiococcinæ, the larva resembling *Crocido-cysta*; the adult, *Sphaerococcus*—Australian insects! The galls were abundant on the leaves.

I found at Pinos Altos two other species of oaks (*Q. Gambelii* and *Q. hypoleuca*), kindly identified for me by Mr. C. A. Keffer, but on neither of them did I observe any Coccidæ. Pinos Altos is the only locality in the Rocky Mountains where I have seen as many as three species of oaks growing on one hillside.

A SUMMARY OF THE MEMBERS OF THE GENUS
CHIOSIA, MEIG., IN NORTH AMERICA, WITH
DESCRIPTIONS OF NEW SPECIES.

BY W. D. HUNTER, ASSISTANT IN ENTOMOLOGY, UNIVERSITY OF NEBRASKA.

Chilosia signatiseta, n. sp.

Eyes bare, arista plumose, scutellum with long hairs on the margin, third antennal joint very large, bright yellowish-red. Legs black.

Male.—Front prominent, opaque, strongly sulcate medially, very indistinctly punctulate, long black pilose. Face shining black, pollinose on the sides and pilose on orbital margin below; below the antennæ deeply concave to the tip of the tubercle, thence gently concave to the epistoma. Tubercle projecting somewhat beyond the base of the third antennal joint, round. Cheeks shining, sparsely whitish pilose. Ocellar area black pilose. Eyes metallic. First antennal joint black, second dark reddish-brown, third bright yellowish-red, very large, subquadrate, with the lower outer corner rounded, upper corner obtusely pointed. Arista basal, black, incrassate, densely plumose. Dorsum of the thorax very lightly punctate, shining greenish-black, abundantly whitish pilose (viewed from in front) mixed with black in the middle, longer posteriorly. Scutellum lightly punctate, abundant long black pilose, with a few light hairs intermixed. Pleura abundant long whitish pilose. Abdomen with the sides almost parallel, short sparse yellowish pilose, more abundant on the sides, where it is intermixed with a few black hairs. First segment entirely opaque, second and third except on the lateral margins, fourth entirely, bright shining greenish. Legs black, all the knees reddish; pile in most reflections black; on the under side of all the tarsi and the anterior tibiæ, golden in some reflections. Wings hyaline, veins dark brown, apical cross-vein almost straight, without stump. Length, $7\frac{1}{2}$ mm. Al., 7 mm.; \pm 4-5 mm. wide.

Female.—Differs from the male in having the front shining and lighter pilose, the dorsum shorter pilose, the abdomen entirely shining, and the third antennal joint much larger; in this sex it is enormous—one and one-half times as large as in the male, but of the same shape.

Three specimens; Moscow, Idaho; Prof. J. M. Aldrich.

This species is closely allied to *C. Willistoni*, but is specifically quite distinct in the larger size and different shape of the third antennal joint, in the fact that the arista is densely plumose, while in that species it is loosely so, and that in the male the abdomen is largely opaque.

The third joint of the antennæ in *C. Willistoni* is small, subquadrate, and very much rounded at the tip; in the present it is very large, subquadrate, and obtusely pointed at the tip.

Chilosia cyanea, n. sp.

Eyes bare, arista plumose, scutellum with bristles on the margin, third antennal joint subquadrate, a little longer than broad, bright reddish-yellow. Legs black.

Female.—Shining blue. Front slightly sulcate medially, shining black, distinctly punctate, black pilose. Face shining black, not pilose, almost imperceptibly pollinose, deeply concave below the antennæ (so that in profile the concavity recedes to the eyes), tubercle rounded, obtuse, projecting about as far as the middle of the third antennal joint, below the tubercle almost straight (so that a line from the apex of the antennal callosity parallel to the posterior eye margin would coincide with the outline of the face below the tubercle). Cheeks shining black, nearly bare. First and second antennal joints black, second reddish at the apex. Third joint of medium size, a trifle longer than wide, subquadrate, with the lower outer angle rounded, light reddish-yellow, light pollinose in some reflections. Arista at the extreme base of the joint black, incrassate for about one-half of its length, long loose plumose. Occiput olivaceous, lightly pollinose, superiorly black and inferiorly white pilose. Thorax shining blue, finely punctate in front, more coarsely so posteriorly and on the scutellum, with very short black pile, lengthened into slender bristles on the sides posteriorly and on the border of the scutellum. Scutellum entirely shining blue, its pile and that of the adjacent dorsum yellow (viewed from in front). Pleura shining, with light-coloured pile. Abdomen broadly ovate, widest at the apex of the second segment, everywhere shining blue, less strongly punctured than the scutellum, with short white pile that when viewed from above appears to form narrow oblique bands, meeting at the middle of the anterior margin of the segments. Tarsi and legs, except the knees, black. Wings hyaline, much longer than the abdomen, tegulæ and veins testaceous. Posterior cross-vein slightly incurved, apical cross-vein straight, with outward stump at base and about one-third of its length above. Length, $7\frac{1}{2}$ mm. Al., 8 mm.

One specimen; Moscow, Idaho; Prof. J. M. Aldrich.

This species is closely related to *C. Willistoni*, but may be separated from that species by the general colour and by the colour of the third antennal joint.

Chilosia Aldrichi, n. sp. (Named after Prof. J. M. Aldrich.)

Eyes bare, arista scarcely pubescent, scutellum without bristles, legs black.

Female.—Shining black, almost bare. Front trisulcate, coarsely punctate, yellow pilose. Face shining on middle portion, powdered on the sides, between the lateral sutures and the eyes short pilose, below the antennæ deeply concave, below the tubercle slightly so. Tubercle round, projecting as far as the apex of the third antennal joint. Cheeks shining black, white pilose. Occiput shining olivaceous, light pilose. Ocellar area with a few black hairs. Antennal joints one and two black, third flattened, oval, slightly longer than broad, reddish-brown, darker above. Arista basal, almost bare, black, somewhat incrassate at base. Dorsum shining black, lightly punctate, very sparsely short yellow pilose, humeri dark. Pleura shining, pilose like the dorsum. Scutellum black, shining, more strongly punctate than the dorsum. Abdomen oval, widest at the apex of the second segment, everywhere shining black; black pubescent in the middle, and short white pilose at the sides anteriorly. Legs black; front pairs, including the coxæ on the under side and posterior tarsi at apex, very indistinctly golden pubescent. Wings subhyaline, indistinctly tinged on the basal half with brownish, long, rather slender, veins brown. Apical cross-vein without stump, except at the base. Tegulæ white. Length, 9 mm. Al., 8 mm.

Three specimens; Craig's Mt., Idaho; Prof. J. M. Aldrich.

The colour of the third antennal joint in this species varies from very dark reddish to almost black.

TABLE OF NORTH AMERICAN SPECIES OF CHILOSIA.

1. Eyes pilose.....	2
Eyes bare.....	8
2. Legs black.....	<i>Aldrichi</i> , n. sp.
At least the tibiæ more or less light-coloured.....	3
3. Third joint of the antennæ light reddish-yellow or yellow.....	4
Third joint of the antennæ black or reddish-brown.....	5
4. Abdomen shining (female), arista black.....	25
Abdomen largely opaque (female), arista brown.....	28
5. Third antennal joint nearly square.....	6
Third antennal joint rounded.....	7
6. Face in profile almost vertical below the antennæ, produced considerably below the eyes.....	<i>lasiophthalma</i> .

- Face strongly concave below the antennæ.....*Baroni*.
7. Shining portion of the abdomen steel-blue; pile of the front light-coloured.....*chalybescens*.
Shining portion of the abdomen metallic-green; pile of front black.....*occidentalis*.
8. Legs black; at most, the knees lighter.....9
Tibiæ at least largely yellow.....14
9. Third antennal joint black.....27
Third antennal joint brown, yellow or reddish-yellow.....10
10. Arista plumose.....11
Arista bare.....13
11. Third antennal joint reddish-brown; arista loosely plumose; general colour blackish; antennæ moderate in size (female)....*Willistoni*.
Third antennal joint bright reddish-yellow.....12
12. Arista densely plumose; general colour blackish; dorsum of thorax (female) yellowish pilose; third antennal joint very large (female).....*signatiseta*, n. sp.
Arista loosely plumose; general colour blue; dorsum of the thorax (female) not black pilose, but black pubescent (viewed from in front).....*cyanea*, n. sp.
13. Third antennal joint reddish-brown or brown; rounded; tegulæ black ciliate; wings blackish in front.....*nigripennis*.
Third antennal joint reddish-yellow, subquadrate; tegulæ white ciliate; wings not blackish in front.....*versipellis*.
14. Scutellum without bristles or bristlelike hairs on the margin.....15
Scutellum with bristles or bristlelike hairs on the margin.....18
15. Posterior femora largely reddish, or at least so coloured at the base.....23
Posterior femora, except the tip, always black.....16
16. Abdomen entirely shining in both sexes.....*comasa*.
Abdomen, at least in the male, largely opaque.....17
17. Four anterior tibiæ entirely yellow; pile of front light-coloured.....*capillata*.
Four anterior tibiæ yellow only at apex and base; pile of front black.....*tarda*.
18. Arista briefly pubescent.....19
Arista plumose or long pilose.....20
19. Femora yellow.....*prima*.
Femora largely black or brown.....24

20. Third antennal joint quadrangular.....*Townsendi*.
Third antennal joint rounded-ovate or ovate.....21
21. Abdomen in both sexes entirely shining.....26
Abdomen of the male largely opaque.....22
22. Posterior femora on basal third, and at apex, yellow; scutellum yellow, except the narrow base.....*pallipes*.
Posterior femora, except the apex, black; scutellum only piceous at apex; first posterior cell broader and last section of fourth longitudinal vein accordingly longer.....*tristis*.
23. Second abdominal segment partly opaque; four anterior tibiae entirely yellow.....*prima*.
Abdomen entirely shining; four anterior tibiae with at least a dark band.....*parva*.
24. Pile of dorsum of thorax black, abundant.....*sorocula*.
Pile of dorsum of thorax sparse, whitish or yellowish.....29
25. Thorax long pilose, third antennal joint moderate; arista pubescent.....*aurotecta*.
Thorax short pilose.....27
26. Anterior femora largely black.....*cyanescens*.
Anterior femora yellow.....*plumata*.
27. Scutellum with bristlelike hairs.....*levis*.
Scutellum destitute of such hairs.....*lucta*.
28. Scutellum with bristles.....*petulca*.
Scutellum without bristles.....*sororia*.
29. Pile of the abdomen long, yellow.....*chalybescens*.
Pile of the abdomen short.....*hoodiensis*.
30. Posterior femora light-coloured at base and apex; dorsum of thorax smooth.....*pallipes*.
Posterior femora light-coloured only at the apex; dorsum of thorax roughened.....*leucoparva*.

CATALOGUE OF THE DESCRIBED NORTH AMERICAN SPECIES OF CHILOSIA.

Chilosia.Meigen; Syst. Besch. III., 296 (1822), *Cheilosia*.

Ibid., id., VII., 128 (1838).

Cartosyrphus, Bigot, Ann. Soc. Ent. Fr., 1883; 555. (Will.)*Melanogaster*, Bigot, Ann. Soc. Ent. Fr., 1883; 258. (Pt.)*Syrphus* and *Eristalis* ex parte, auctorum.

Chilosia Aldrichi, Hunter ante.

Chilosia aurotectæ, Giglio-Tos ; *Bulletino Mus. Zool. e. Anat. R. Univer.*, Torino ; Vol. VII., 132, p. 4. (1892). Orizaba, Mexico.

Chilosia Baroni, Willist., *Syn. N. A. Syrph.* 40. (1886). Cala., Washington State.

Chilosia capillatæ, Loew, *Centur. IV.*, 65, 1863.—O. S. Cat. N. A. Dipt., 1878, p. 121 ; Will. *Syn. N. A. Syrph.* 43. D. C.—Virginia. *Cartosyrphus lamprurus*, Bigot, *Ann. Soc. Ent. Fr.*, 1884, 552 (Will.)

Chilosia chalybescens, Will., *Kans. Uni., Quart. Vol. II.*, No. 2, 1893. Cala.

Chilosia chrysochlamys, Will., *Biol. Cent. Am. Dipt.*, III., p. 8 (1891). Omilteme, Mexico, and Sierra de las Aguas Escondidas, Mex.

Chilosia comosa, Loew, *Cent. IV.*, 66, 1863.—O. S. Cat., 1878, 121., Will. *Syn. N. A. Syrph.* 44. Colo., English River; Winnipeg.

Chilosia cyanea, Hunter ante. Idaho.

Chilosia cyanescens, Loew, *Cent. IV.*, 66, 1863.—O. S. Cat., 1878, 121. Will. *Syn. N. A. Syrph.* 42. Conn.; New Hampshire ; Illinois.

Chilosia hoodiensis, Bigot, *Ann. Soc. Ent. Fr.*, 1884, 552 (*Cartosyrphus hoodianus*). Will. *Syn. N. A. Syrph. Appendix*, 292. Oregon.

Chilosia lævis, Bigot, *Ann. Soc. Ent. Fr.*, 1883, 552 (*Cartosyrphus*). Will. *Syn. N. A. Syrph. Ap.* 292. Washington State.

Chilosia lasiophthalma, Will., *Proc. Am. Phil. Soc. XX*, 306, 1882. *Ibid.* *Synopsis*, 40, 1886. Colorado.

Chilosia leucoparea, Loew, *Cent. IV.*, 69 —O. S. Cat. N. A. Dipt., 1878, 121 ; Will. *Syn. N. A. Syrphidæ*, 45. Carolina.

Chilosia lucta, Snow, *Kans. Uni., Quart. Vol. III.*, 228, April, 1895. Colorado.

Chilosia nigripennis, Will., *Proc. Am. Phil. Soc. XX.*, 307 ; 1882. Oregon. *Cartosyrphus infumatus*, Bigot, *Ann. Soc. Ent. Fr.*, 1884, 553.

Chilosia occidentalis, Will., *Proc. Am. Phil. Soc. XX.*, 305. *Ibid.* *Synopsis*, 41. California.

Chilosia pallipes, Loew, *Cent. IV.*, 70, 1863.—O. S. Cat. N. A. Dipt., 1878, 121. Will. *Synopsis*, 41, *Ib.* *Appendix*, 293. White Mts.; Washington, Cala.

Chilosia parva, Will., *Proc. Am. Phil. Soc. XX.*, 307 ; 1883. Oregon. *Melanogaster ochripes*, Bigot, *Ann. Soc. Ent. Fr.*, 1884, 555. (Will.)

Chilosia petulca, Will., *Synopsis* 39, 1886. Snow, *Kans. Uni., Quart. Vol. III.*, 228. State of Washington ; Colorado.

- Chilosia plumata*, Loew, Cent. IV., 68, 1863.—O. S. Cat. N. A. Dipt., 1878, 121. Will. Synopsis, 42, 1886. Virginia.
- Chilosia prima*, Hunter, CAN. ENT. XXVIII., 92, 1896. Pennsylvania.
- Chilosia signatiseta*, Hunter ante. Idaho.
- Chilosia sorocula*, Will., Biol. Cent. Am. Dipt. III., 1891. Snow, Kans. Uni., Quart. III., 228. Mexico: Omilteme, 8,000 feet; Xucumanatlan, 7,000 feet; Sierra de las Aguas Escondidas, 7,000 feet;—all in Guerrero, U. S., New Mexico.
- Chilosia sororia*, Will., Biol. Cent. Am. Dipt. III., 9, 1891. Mexico. Ciudad in Durango, 8,100 feet.
- Chilosia tarda*, Snow, Kans. Uni., Quart. Vol. III., 228. Colorado.
- Chilosia Townsendi*, Hunter, CAN. ENT., Vol. XXVIII., 94, 1896. California. *Chilosia* sp., ? Townsend, Dipt. Baja, Cala., in Proc. Cala. Acad. Sci. Series ii., Vol. 4, 611.
- Chilosia tristis*, Loew, Cent. IV., 71, 1863.—O. S. Cat. N. A. Dipt., 1878, 121. Will. Synopsis, 41. Red River. (Loew.)
- Chilosia versipellis*, Will., Synopsis 44. State of Washington.
- Chilosia Willistoni*, Snow, Kans. Uni., Quart. Vol. III., 227 (1895). Cala.; Col. This species was described as *C. lugubris* by Williston—Synopsis, p. 45, 1886. Snow has suggested the present name because "the name *lugubris* is preoccupied for a Swedish *Chilosia* by Zetterstedt." According to Herr T. H. Becker, Zetterstedt's species will not stand, as the types of that species are partly teneral forms of a well-known species of Meigen and partly mature specimens of other species. However, this does not affect the propriety of Mr. Snow's suggestion which I have adopted.

SPECIES NOT INCLUDED ABOVE.

- Chilosia frontosa*, Bigot, Ann. Soc. Ent. Fr., 1883, 552. Will. Synopsis, p. 46. Mexico.
- Chilosia rufipes*, Bigot, Ann. Soc. Ent. Fr., 1884, 555 (*Melanogaster*).

It is quite probable that this species is a *Chilosia*, from the fact that Mr. Bigot, in his table for the separation of the genera of Syrphidæ, distinguishes *Melanogaster* from *Cartosyrphus* by the fact that in the former genus, "Face, female, pourvue de sillons lateraux."

It will be impossible to recognize the species from the description, as the three very important characters—the bareness or pilosity of the eyes and arista, and the presence or absence of bristles on the scutellum—are entirely omitted.—North America (Bigot).

- Chilosia*, n. sp.? Snow, Kans. Uni., Quart. Vol. III., 229. Colorado.

A NEW PULEX FROM QUEEN CHARLOTTE ISLANDS.

C. F. BAKER, FORT COLLINS, COLO.

Pulex Keeni, n. sp.

Belonging to Division II., group two of the genus as given in my Preliminary Studies. Nearest *sciurorum*.

Head without combs of spines, in the female normal, highest at the occiput, gradually sloping forward, then rapidly curved in front, anterior edge of face nearly perpendicular, but rounded; head in male flat above or slightly concave, strongly rounded in front, the anterior edge of the face slightly receding. Bristles on head few, these being on both sides of the antennal groove and on the occiput. Antennal groove open, bristles on joint 2 short. Mandibles equalling or slightly exceeding the fore coxæ. Pronotal comb of twenty-two spines. Bristles on dorsal abdominal segments in two rows, the second of six to ten rather short bristles, on the ventral segments in single rows of usually six bristles. First three or four dorsal segments furnished on discs with two to six very short stout teeth. Leg spines rather weak except on the fore coxæ and all the tibiæ. Apical spines on joint 2 of hind tarsi much shorter than joint 3; two of the apical spines of middle tibiæ longer than first joint of tarsi. In fore tarsi joint 1 equals 2 and three-fourths of 5, 3 a little shorter than 5, and 4 little more than half of 5. In the middle tarsi joint 5 equals three-fourths of 2, 3 is one-half of 1 and nearly equals 5, and 5 is twice 4. In the hind tarsi joint 2 is two-thirds of 1, 1 is two and a half times 3, 2 equals 3 and 4 together, while 4 is one-half of 3, which is somewhat longer than 5. In the male the upper claspers are long, narrow, pedunculate, sides nearly parallel, anterior margin slightly angulated, apex rectangular and furnished at tip behind with a long, stout bristle, and on posterior edge with two short, stout, blunt black spines; the lower or posterior claspers differ widely from those of *sciurorum* in being short and suddenly broadened towards the tip. Colour light brown. Length: male, 2.5; female, 3 mm.

Described from several specimens taken on *Sitomys Keeni*, at Masset, Queen Charlotte Islands, in August of 1895, by Rev. J. H. Keen, to whom the species is dedicated. I am indebted to Dr. James Fletcher for the opportunity of examining this very interesting and well-marked form.

NOTES ON SAWFLY LARVÆ.

BY HARRISON G. DYAR, PH. D., NEW YORK.

Trichiosoma triangulum, Kirby.

Two flies have emerged from cocoons which had passed two winters. Last summer I noticed an example of mistaken instinct. The eggs of this species are laid under the lower epidermis by saw-cuts in the edge of the leaf. Several eggs so laid were found on *Ilex verticillata*. In due time the larvæ hatched, but refused their food, and would undoubtedly have perished had I not recognized them and supplied them with willow, which they attacked voraciously.

Macrophya tibiator, Norton.

The description of the larva of this species in Harris's Correspondence, p. 369, is included in the first paragraph only. The remaining notes under the same heading refer to larvæ of *Harpiphorus variatus*.

M. tibiator has a variable number of stages, difficult to determine, much as in the case of *H. variatus*. I have mature larvæ with width of head 1.4, 2.2 or 2.5 mm. The following description is a little more definite than that of Harris, though his is excellent:—

Pale yellowish, thickly overspread with a fine mealy-white secretion, less abundant subventrally and on the legs, which consequently appear yellowish; venter without bloom; anal plate concolorous. On vertex of head a large defined black band ending in a rounded point above the clypeus; eye in a black spot. Segments 7-annulate; a row of small velvety black lateral spots, two per segment (on third and fifth annulets above the spiracle), the anterior spot the larger; only one spot on joints 3 and 4, none on joint 2, and only a trace of any on joint 13. Thoracic feet colourless, with a black mark at the extreme base. Abdominal feet on joints 6 to 13. The larvæ curl spirally like the *Cornus* larvæ. Sometimes the white secretion become slightly woolly, but never as in *H. variatus*. Head only slightly pruinose.

Ultimate stage.—Head shining, dull honey-yellow, finely shagreened, no marks; eye black. Body segments neatly 7-annulate, very shining, pale greenish-yellow, without marks or any white bloom except the dark spiracles and faint tar-brown shades in the folds. Thoracic feet colourless. The larvæ immediately enter the earth. Found on the elder (*Sambucus*) in VanCortlandt Park, New York, and also sent me by Mrs. Slosson, from Franconia, N. H.

Harpiphorus maculatus, Norton.

I think the last word has not been said in the controversy as to the identity of this form with *Monostegia ignota*. Mr. Mally apparently disposed of the question (Insect Life, III., 9) by showing that *M. ignota* had always four submarginal cells and came from a larva with immaculate head, whereas *H. maculatus* may have three or four submarginal cells, but comes from a larva with a black spotted head.

Now I have to record the breeding of two specimens of *H. maculatus* from larvæ with black spotted head (as required), but also two specimens of the same insect (three submarginal cells) from larvæ with immaculate head, on strawberry, and another specimen from a similar larva on raspberry.

These observations are contradictory to Mr. Mally's conclusions ; but agree with the original contention of Mr. Harrington, that the species are identical. Another fact is in favour of Mr. Harrington's view. The larvæ of both forms are structurally and in habits those of *Harpiphorus* (or *Emphytus*), not *Monostegia*, *Eriocampa* or *Caliroa*. The two types are rather distinct.

Egg.—I have nothing to add to Mr. Mally's account.

Stage 1.—Head black or dark brown, with a black shade around the eye ; width .25 to .3 mm. Body whitish, rather opaque, but the food showing by transparency ; distinctly annulate, no marks. Thorax slightly enlarged. Rests with the body extended.

Stage 2.—Head pale brown, with or without traces of a vertical and lateral black patch ; eye black ; width .4 mm. Body all whitish, food showing ; annulate, as before.

Stage 3.—Head pale brown or whitish-testaceous, shining, the eye black, immaculate or with the three black spots of the mature larva (black spotted variety) ; width .6 mm. Body whitish, not shining, about 6-annulate, no marks. The larva rests with the body curled.

Stage 4.—Head whitish to pale brown, as before ; width .8 mm. Body whitish, like ground glass, only coloured by the food from within. Feet on joints 6 to 13 ; thorax a little larger than abdomen ; head large in proportion.

Stage 5.—Head whitish or slightly brownish, immaculate, except for the black eye, with a trace of black shades or a dusky black cloud on the apex and a smoky darker patch behind and a little above the eye ; width 1.0 to 1.15 mm. Body as in the next stage, but without the small points ;

immaculate or with more or less distinct traces of a dusky lateral band ; rarely a faint black suranal dot.

Stage 6.—Head whitish, with a brown shade over the vertex, or pale brown, immaculate or with the three black patches ; eye black ; a groove at the vertex of each lobe ; width 1.3 to 1.5 mm. Thorax enlarged, mostly dorsally, the lateral outline regular ; segments neatly 6-annulate, with minute blunt white points on the second and fourth annulets. Whitish, not shining, a faint green tint dorsally. Thorax dark green from the large crop full of food ; posterior portion of alimentary canal nearly empty ; dorsal vessel greenish. No marks or a lateral smoky black band of segmentary dusky patches and traces of a geminal dusky dorsal shade. A small quadrate black suranal patch. Thoracic feet colourless, with brown tips ; tracheæ not very evident. Sits with the body outstretched or curled.

Stage 7 (ultimate stage*).—Head sordid whitish, vinous tinted or pale greenish, immaculate or with the spots represented by leaden or tar-brown shades ; width as before. Body the same colour, more or less shaded with tarry-brown in the folds and in an indistinct subdorsal shade.

Caliroa obsoleta, Nort. (CAN. ENT., XXVII., 338, 3S.)

Head very pale testaceous, eye black ; width .7 mm. Body colourless or very faintly greenish, food showing distinctly. Skin shining and sticky ; feet on joints 6 to 12, all colourless, including the thoracic feet. Thorax enlarged, the feet truncate.

Ultimate stage.—Not shining, rather opaque pale whitish ochreous ; segments obscurely annulate, with transverse dorsal shining areas.

Feeds on wild cherry (*Prunus serotina* and *P. pennsylvanica*). Rests on the under side of the leaves, never on the upper ; solitary. The larva is smaller than *Eriocampa cerasi*, without any trace of the blackish colour.

The variation in the number of submarginal cells and in the colour of the head in the larva of *Harpiphorus maculatus* recalls the case of *Monostegia quercus-albæ*. If we disregard the colour of the head here also, there are still three well-marked types of larvæ as follows :—

1. On white oak, rarely on black oak ; sides of the thorax concolorous with the body ; head colourless, pale brown or black. Imago, 16 speci-

* I propose this term for that final larval stage of certain sawflies in which they do not feed, but only seek for a place for pupation ; the colour is usually markedly different from the preceding stage, but the head has the same width.

mens: four with two middle cells in hind wings, five with one middle cell, and seven with no middle cells (five of the latter are males; all the rest females). Larva with the pale head described in Trans. Amer. Ent. Soc., 1867, and CAN. ENT., XXVII., 195, as *M. q.-albæ*; with black head, described, CAN. ENT., XXVI., 43, and XXVII., 195 (the last time as *Caliroa obsoleta*).

2. On black oak, rarely on white oak and yellow birch; sides of thorax orange tinted; head whitish or black. Imago, nine specimens: seven with two middle cells in hind wings, at least on one side; two with one middle cell on both sides. Larva with pale head described, CAN. ENT., XXVI., 42, as *M. q.-coccineæ*; with the black head, CAN. ENT., XXVII., 193, as *Eriocampa fasciata*.

3. On wild cherry, entirely pale, and never gregarious, as the two preceding generally are. Imago, four specimens with no middle cells in the hind wings. Larva described as *Caliroa obsoleta*.

Pristiphora grossulariæ, Walsh.

Larvæ common on gooseberry at Jefferson, N. H. The four last stages were observed with widths of head .4, .6, .8, 1.2 mm. The segments are obscurely 6-annulate, with minute dark setæ on the second and fourth annulets, and on the subventral region; no anal prongs. Walsh's description is sufficient.

Pristiphora tibialis, Norton.

I have already described this larva on birch and willow. The occurrence on the latter food plant would seem to confirm Norton's original suggestion that the species is the same as *P. sycophanta*, Walsh, since the larvæ might have entered a deserted gall on their food plant when preparing to spin and thus be classed by Walsh as "inquiline." More recently I have bred *P. tibialis* on high bush huckleberry (*Vaccinium*) from near New York City. The following is a description of the single larva found on this plant: Abdominal feet on joints 6 to 11. Head pale testaceous greenish, a brown shade from the eye to the vertex and a darker one on the median suture, spreading out on the clypeus; width 1.3 mm. Body clear green, rather dark; dorsal vessel a distinct black band edged with a broad green stripe of fat-granules which fade away to near the lateral area, blending into the ground colour. On joint 13 a dorsal and subdorsal mass of fat, the end of the joint solidly filled in with the green fat. Segments rather distinctly 6-annulate; subventral

folds black dotted. Thoracic feet faintly brownish. The larva rests on the edge of the leaf, curling its body more or less downward.

Nematus dorsivittatus, Cresson.

Larvæ on poplar at Jefferson Highlands, N. H. Identical with *Nematus mendicus*, except in size; width of head 1.7 mm. The dark spottings on the head fail to separate these species, for in these most recent specimens of *N. dorsivittatus* they are about as distinct as in *N. mendicus*. The anal prongs pointed, black tipped. Larva described, Trans. Am. Ent. Soc., XXII., 303.

Cladius pectinicornis, Fouch. (= *isomera*, Harris.)

Larvæ on wild rose in VanCortlandt Park, N. Y. Five stages observed with width of head .3, .5, .7, 1.0, 1.4 mm. No ultimate stage. The larvæ are already adequately described.

AGRONOMA AGAIN.

BY JOHN B. SMITH, SC. D.

In 1895, according to Mr. A. R. Grote, "the European type of *Agronoma* seems certainly to be *vestigialis*." This species was declared to be congeneric with the American species classed by me as *Feltia*, and the latter genus was dropped in favor of *Agronoma*, and Mr. Slingerland was scolded because he had adopted the generic name used by me. In the January (1896) number of the CAN. ENT. I pointed out for Mr. Grote's benefit, and also for the information of American students, that there existed certain points of structural difference which had escaped Mr. Grote's examination, which made the declared type of *Agronoma* a member of the genus *Agrotis* as restricted by me, the latter genus being based upon the very species which Mr. Grote said was its type. As the result of this paper, it has become much less "certain" to Mr. Grote's mind that *vestigialis* is, after all, the type of *Agronoma*, and on reconsidering the matter, it seems to him that *crassa* had better be considered the type. Mr. Grote states, in the June number of the journal of the New York Entomological Society: "I have examined here, in the Roemer Museum, specimens of *crassa*. The fore tibiæ are heavily armed; the front is roughened or tuberculate; the male antennæ are pectinate. It is therefore a *Feltia*" "It follows that the type of *Agronoma* must be changed, and *crassa*, the first species cited, is then the type." It is to be noted that Mr. Grote refers to the front as being "roughened or

tuberculate," and this at once made it more than reasonably doubtful whether his conclusion, "It is therefore a *Feltia*," was justified; because in *Feltia* the front is not tuberculate; it is roughened and protuberant only. A tuberculate front is the chief characteristic of Mr. Grote's genus *Carneades* and of my genus *Porosagrotis*. It became necessary, therefore, for me to examine specimens of *crassa*, and this again presented evidence of Mr. Grote's failure to make strictly accurate, scientific statements. The structure of *crassa*, with the exception of the pectinated antenna, is exactly the same as that of his genus *Carneades*, and it adds force to what I previously said, that Mr. Grote did not recognize the extent of his own genus when he described it. The pectinations of the antennæ in this group are not of generic value. *Feltia* contains some species that have antennæ pectinated, and some that have them serrated. Both *Porosagrotis* and *Carneades* contain species ranging in the same way, with either pectinated or serrated antennæ; but the essential point, the tuberculate clypeus or front is characteristic of Mr. Grote's genus *Carneades*, and this is exactly what he failed to recognize in the European species *crassa*. My genus *Porosagrotis* is the only one ever described by me which is based on genitalic characters. In *Carneades* the clasper is forked, or consists of two prongs. In *Porosagrotis* the clasper is single. Now, in *crassa* we have exactly the same structure that we find in *Porosagrotis*, and the species is rather closely allied in general appearance to what I have described as *dædalus*, and also to Mr. Grote's species, *texana*. If *crassa* is the type of *Agronoma*, *Agronoma* must replace *Porosagrotis*. If *Porosagrotis* is not a good genus, because based on genitalic characters, Mr. Grote's *Carneades* must sink in favour of Hübner's *Agronoma*. It does not make very much difference to me which conclusion is adopted. Mr. Grote expresses himself as much obliged to me for showing the necessity of changing the type of Hübner's genus. I am equally obliged to him for giving me another opportunity to show how little his statements as to structural characters can be trusted.

There is another point that may be mentioned here. Mr. Grote has several times referred to *Mamestra comis*, and has questioned the correctness of my reference of this form to *olivacea*. Most recently he questions the correctness of my identification of the type, and from descriptions refers *circumcineta* as the same as *comis*. I called attention, in speaking of *comis*, to the fact that the insect was peculiarly set and that it was a remarkably pretty specimen, and I may add that the

description is a very good one of the type seen by me. The peculiarity about the specimen is that it was very fresh when caught, and the wings, apparently, had not become entirely hardened. When placed upon the spreading-board they broke near the base and formed a little shoulder, such as almost every one who has ever spread insects has found himself compelled to deal with. The insect was well spread in other respects, and the little break of the wings was almost concealed by the heavy vestiture of the thorax. With its bright colours and the comparatively broad, short wings, produced by the imperfection just mentioned, the specimen has quite a distinctive appearance, and it was in seeking to locate just exactly what this distinction consisted of, that I might place the species into its proper place in a synoptic table, that I found that it did not differ in any respect from *olivacea*. I have in my collection at the present time a specimen which agrees in brightness of colour and general appearance with *comis*, but being fully matured and with the wings at full length, shows its relation to *olivacea* at a glance. I would again call attention to the extreme desirability of verifying Mr. Grote's statements before accepting them when they involve a change in nomenclature or in the synonymy.

ADDITIONS AND CORRECTIONS TO MY 1894 LIST OF
WINNIPEG BUTTERFLIES, WITH NOTES FOR
SEASON OF 1895.

A. W. HANHAM.

Argynnis cipris, Edw.—One specimen taken August 4th. Kindly identified by Mr. James Fletcher.

Phyciodes carlota, Reak.—One specimen. June, 1894.

Phyciodes, sp.—Five specimens taken June 17th to 24th, 1894, and recorded as *Nycteis* in error in my 1894 list.

Phyciodes nycteis, Db.—Hew.—June 30th to July 10th. Common in a new locality visited this year. Not taken in 1894.

Colias eurytheme, Bdv.

var. *eriphyle*, Edw.—August 4th; etc.

var. *keewaydin*, Edw.—August 4th; etc.

Colias philodice, Gdt.—This species may not occur here; *C. eriphyle*, Edw., being mistaken, most likely, for it.

Pamphila ottoe, Edw.—June 30th (a ♀), July 1st (a ♀ and a ♂). The male was lying with its wings expanded (as if at rest) on a flower head in a clearing; it was dead, however, but a fair specimen. Kindly identified by Dr. Hy. Skinner.

Amblyscirtes vialis, Edw.—One. June 30th.

Owing to a visit to England in the spring, I did no collecting here until nearly the end of June, consequently many of the early-occurring species were missed. On the 23rd June very few species were flying. "Blues" were plentiful; *Scopoliolus* especially so, mostly ♀. Other species were: *Melissa* (only males), *Afra* (1), *Lucia* (1). "Skippers," only a *Cernes* and a worn *Pylades*. *Danaus archippus* and *Cænonympha inornata* complete the list.

From that date until the end of the season many visits were paid to the different favourite localities around the city, but "things," almost without exception, were scarce, and many of the species taken in 1894 were not met with. Not a single *Thecla* or *Papilio* was seen on the wing.

Phyciodes tharos, Dru.—Pupæ of this species were found on July 4th and 14th, attached to the palings of my back yard.

Pyrameis cardui, Linn., was very noticeable on the wing, in and around the city, at the end of June and early in July, and later the webs of its larvæ were thick among the thistle heads everywhere. Very few of these, I think, reached the "imago" state.

Cænonympha inornata, Edw.—Specimens of this butterfly taken June 23rd were mostly worn, but the species was met with as late as July 10th.

Lycæna melissa, Edw.—Captured or seen June 23rd, July 23rd, August 24th and 25th, and September 2nd. On August 25th I took my first and only ♀.

Thymelicus garita, Reak.—This species occurred in some abundance locally from June 30th to July 13th, but most of the specimens netted were poor.

Pamphila manitoba, Scud.—According to Dr. Skinner, my Winnipeg specimens are the var. *Assiniboia*, Lyman. I captured one this season (August 4th), and have yet to take my first ♀ here.

The Canadian Entomologist.

VOL. XXVIII.

LONDON, OCTOBER, 1896.

No. 10.

SOME NOTES ON INSECT ENEMIES OF TREES.

BY A. D. HOPKINS, WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION.

The study of forest and shade tree insects is a line of entomological work demanding especial attention in the State of West Virginia. During the past two years I have carried out quite an elaborate line of investigations and experiments on this subject. The *first* object was to conduct investigations with reference to the forest conditions, the distribution of forest trees, and the relation of certain kinds of forest growth to the occurrence and range of the several life zones, and minor divisions of the same in the State. *Second*, to ascertain as far as possible the principal insect enemies of forest growth and their habits, as well as to study the climatic and other conditions that might be favourable or unfavourable for their multiplication; or the extension of their depredations. *Third*, to determine by experiments and otherwise some improved and practical method of preventing the losses that are occasioned by the more destructive kinds, especially those caused by bark and wood infesting insects.

Sufficient evidence has been obtained in the first object to enable me to prepare a preliminary map of the forest divisions of the State and the probable range of the life zones. Considerable information has also been added with reference to the habits of some of the more destructive insects, and some results have been obtained towards successful methods of preventing serious losses from their attacks on felled timber.

The studies with reference to preventives and remedies include a line of experiments which has already given good results and promises better ones in the future. The experiments include the cutting of different kinds of trees twice a month, year after year, until sufficient evidence is obtained to enable me to arrive at some definite conclusions with reference to the proper times to cut timber to secure the least possible damage from insect attack.

This line of experiments has been carried on regularly in different sections of the State since April, 1895. Observations are made from

time to time during the year, and the condition of the wood and bark is noted, together with the kinds of insects occurring in the same, the character of injury, etc.

It was found necessary to have some convenient method of ascertaining what insects bred in the wood and bark of trees cut in each month. Therefore an insectary was planned and built with this end in view. At present it consists of a room 12 feet long by 9 feet wide and 9 feet high. It is divided into four compartments or rooms, each 3 feet wide and 9 feet long, with 12 breeding cages or boxes, 18 x 12 x 18 inches, in one end. A door opens into each room, and a window 12 x 12 inches above the suite of breeding boxes, near the ceiling, gives the necessary light. The breeding boxes are arranged like drawers, in a case with doors in each opening into the room, and with a 2-inch round window in the back, opposite to a correspondingly small window in the wall. The object of the small windows in the boxes and in the ends of the rooms is to attract the insects to the light when they emerge so that they can be easily collected. Each room is devoted to one kind of wood,—as pine, oak, and hickory. Pieces of the trunk and branches of an infested tree are placed on shelves on one side of the room, and as the insects emerge they fly to the window, where they are collected in a cyanide bottle provided for each room. A shelf is attached just beneath each window and is covered with white paper, so that if any of the smaller insects die, they fall on it and are easily found.

The twelve boxes in the end of each room are used to breed insects from the wood and bark of trees cut in each month of the year. This arrangement of rooms and boxes is proving quite successful. Hundreds of specimens have been obtained, representing many species which would have been difficult to obtain in any other way, and in addition, many important facts have been learned with reference to the food habits of certain species.

One of the most interesting results that has been obtained is from hickory and oak, cut in the winter and summer of 1894. That cut in the winter months is being converted into a powder by *Lyctus striatus*, while that cut during the summer months is but slightly damaged.

I have also found from the cuttings in the forest that the wood of certain species of trees felled during the winter months, as well as of those felled in the late fall and early spring, are seriously damaged by wood-boring insects, while those cut in July and August are either entirely exempt, or but slightly damaged.

FIRE WOUNDS THE PRIME CAUSE OF SERIOUS LOSS OF TIMBER.

In studying the forest conditions and the influences that contribute to the destruction of timber, I have found that a slight injury to the base of a tree by fire offers favourable conditions for the attack of insects, which result in the final destruction of the valuable wood of the tree. The fire burns and kills the bark at one side of the base of the tree, which in itself might not be a serious matter, since subsequent growth would heal it over, but it was found that these slight wounds are subsequently infested by Ptinid, Scolytid and Calandrid beetles and their larvæ; also by Cerambycid, Buprestid and Lepidopterous larvæ, which by their boring either convert the inner dead wood into a dry powder, or their mines give entrance to a "dry rot" fungus*, so that another forest fire finds in these extended wounds the conditions most favourable for a still further extension of the injury. Thus, frequent fires in the same forest may, by this process, burn entirely through the trunk of a large tree.

It was also found that these fire wounds are almost invariably followed by a decayed condition of the heartwood, which results finally in a hollow trunk. Previous observations led me to believe that insects were largely to blame for the destruction of the heartwood of living trees injured by fire and other causes. I therefore had a number of wounded trees felled on November 9th, 1895, and the trunks split open so that I could examine the causes and effects.

I found in nearly every tree thus examined that the rapid extension of the decay was due largely to Cerambycid, Lymexylon and Brenthid larvæ which had entered from eggs deposited in the edges of the fire wounds, and that brood after brood of these larvæ, aided by wood-infesting ants, had completely honeycombed the heartwood for a great distance above the wound. Thus the valuable heartwood was completely destroyed or rendered worthless. By persistent search I was fortunate enough to find in the heart of a chestnut tree the imago of one of the Cerambycid borers, where it had recently transformed within its pupa case. It was located near the heart of the tree, and about four feet and a half above the upper edge of the wound, and three feet above any decayed wood. This beetle was identified for me through the kindness of Mr. Howard, of the Division of Entomology, as *Centrodera bicolor*.

On May 19th, 1896, I cut another example of this species from a tulip log, at Pickens, W. Va., where I had previously discovered (June

* *Merulius lacrimans*.

20th, 1894) a Cerambycid larva, that was found to be exceedingly destructive to the heartwood of large tulip trees, as mentioned in a former paper (Insect Life, Vol. VII., p. 150). Subsequent observations lead me to conclude that this is one of the most destructive wood-boring insects that infests the wood of living trees, and that the destruction of valuable timber by it results largely from primary injuries by fire.

The cocoons of a parasite (*Gymnosetis americanus*, C.) were found in larval mines, evidently of this species, in the same tulip log previously mentioned, which may be of some service in keeping this pest in check. It evidently attacks the larvæ at the time they are forming the exit gallery for the adult, since at other times the larvæ are so deep in the heartwood of the tree that they could not be reached by the ovipositor of the parasite.

On July 7th of the present year (1896), I found a female example of the large and beautiful *Leptura emarginata* ovipositing in the dead wood of a wound in a living beech tree, and numerous large holes were observed in the same wood, from which the beetles had evidently emerged, thus indicating that this species may also be classed among the destructive heartwood borers.

There are probably several other Cerambycid and Buprestid species that contribute to this class of injury to living trees, and, since the results of their work are practically the same, they may be designated as *Destructive Heartwood Borers*.

DESTRUCTIVE BARK BORERS.

With the exception of certain Scolytidæ, notably *Dendroctonus frontalis*, the most destructive and dangerous class of insects that attack living trees belongs to the genus *Agrilus*, since their habit of ovipositing in the bark of healthy trees in which it is possible for the larvæ to develop makes it possible for them to effect a terrible destruction of timber should they ever occur in sufficient numbers to take the character of an invasion.

Agrilus bilineatus is already to blame, either directly or indirectly, for the death of a great quantity of oak and chestnut timber, not alone in West Virginia, but in different sections of the country between here and the Mississippi River. Until last fall the dying of trees with which this insect was intimately associated was decidedly on the increase.

The beech, the dogwood (*Cornus florida*), the hickories, the horn-beam, willows and poplars are suffering more or less from the attacks of this class of bark-borers. These insects are, however, attacked by Braconid and other enemies that may tend to keep them in check; yet, notwithstanding this fact, they must be considered as among the most dangerous enemies of trees.

Sassafras and Sumac Twig Girdlers.—The injury to twigs and branches of sassafras and sumac by Cerambycid twig-girdlers has been on the increase for some years in our State, as is a similar trouble affecting the dogwood. I was fortunate enough to find the beetle that is to blame for the interesting double girdles so common on sassafras, which proved to be *Oberea ruficollis*.

Brenthid Injuries to Rock-Oak Logs.—An interesting observation was made with reference to injuries by *Eupsalis minuta* to rock-oak (*Quercus prinus*) logs from which the bark had been removed for tanbark. It was found that the logs bearing the mark of the axe, where they were girdled in the process of removing the bark, were infested with this destructive pin-hole borer, the eggs having been deposited in the axe wounds. Logs that were not injured by the axe were not infested. Since the peeled logs are often left in the forest for a year or more before they are converted into lumber, it is quite important that the sapwood should be injured as little as possible during the process of removing the bark. If the logs are not thus injured they may remain sound and make good lumber for several years after the tree is felled, but if injured as mentioned, the wood may be literally ruined by the Brenthid within one or two years after the bark is removed.

A Brenthid larva that appears to be quite different from that of *E. minuta* was recently found boring in the heartwood of a hickory tree, and the characteristic mines of Brenthid larvæ have also been observed in the heartwood of wild cherry (*Prunus serotina*) and other trees.

Hickory Nut Phylloxera.—On December 15th, 1895, I found a large hickory tree which presented quite a striking appearance. The nuts, of which it was very full, had not fallen, and upon closer examination it was noticed that they had assumed a curious abnormal growth, which was found to be the work of a Phylloxera. This is probably the work of *Phylloxera caryæcaulis* or a nearly allied species (mentioned in Illinois Agr. Report, 1878, page 160).

A Maple Twig Borer (———) was one of the commonest shade tree pests in West Virginia during the past spring. It attracted general attention in all parts of the State, and was the cause of extensive correspondence in answer to inquiries. It is the larva of a moth that bores in the tips of the young, growing twigs of all species of *Acer*. So common was the injury by it that large trees presented the appearance, in June, of having suffered from a severe frost. It occurred in all the life zones of the State, from the Upper Austral to the Canadian. It makes its appearance soon after the leaves appear in the spring, and continues operations until about the middle of May, the moth emerging in June.

Oyster-Shell Bark-Louse on Pennsylvania Maple.—In May, 1896, I observed, while in the Canadian Zone of the State, that some of the small trees, and twigs on other trees of this maple, were out in leaf far in advance of other examples of the same species, the former being in fruit, while the latter had just commenced to flower. This was found to be due to the influence of the Oyster-Shell Bark-Louse, which occurred on all of the early fruiting twigs in great numbers.

The Locust Leaf Beetle (*Odontota dorsalis*).—This beetle is again common and destructive to the yellow or black locust leaves over the greater part of the State, it being destructive this year in localities which heretofore have been exempt. This beetle has been observed by me feeding on the leaves of white oak, beech, birch, hawthorn, and apple, thus indicating the possibility of its changing its normal habits and becoming destructive to the foliage of other trees, including the more valuable fruit trees.

A Remarkable Injury to the Leaves of Forest Trees by an Unknown Insect.—Last fall, while collecting in and near the western border of the Transition Life Zone, or what is known as Laurel Hill and Cheat Mountain, I observed that the leaves of all kinds of forest trees were literally riddled with holes of various sizes, as if they had been caused by hail when the leaves were young. This condition extended for a distance of four or five miles along the summit of the mountain and down the western slope to what appears to be the line separating the Upper Austral and Transition Life Zones. No trace or evidence could be found at the time to indicate what insect was to blame for this remarkable condition. The region has been frequently visited this spring and summer, and while the

same condition occurs this year as was noted last, and a large number of insects of various kinds have been observed feeding on the leaves, none of those I found were common enough, at any one time, to indicate that they were to blame for the trouble.

I am inclined to think now that it is the work of some nocturnal insect, possibly a Scarabæid.

Xyleborus celsus in Hickory.—On Dec. 1st, 1895, I discovered a number of colonies of a Scolytid in a hickory stump, which revealed numerous males of the species, as well as some good examples of the galleries. The interesting features of the discovery were presented to the W. Va. Academy of Science in a paper read at a meeting held on Dec. 3rd. Attention was called to the rarity of the male, and that this was probably the first time it had been found in company with the female. But one male was found in each colony of 40 to 50 females, and it was usually located at the farther end of one of the galleries, where it was imprisoned by the females, which were closely crowded in the galleries in Indian file, with their heads towards the inner end. One female guarded the single entrance to the suite of galleries from all intruding enemies by stationing herself just within the entrance and presenting her armoured elytral declivity as an impenetrable barrier to the would-be intruders. This habit and method of guarding the entrance to the brood-galleries is common with most Scolytidæ, and possibly serves in part to explain the object of the peculiar form of the elytral declivity in *Platypus*, *Xyleborus*, *Tomicus*, *Scolytus*, and other genera.

Some of the females of the bark-infesting species, after they have fulfilled their mission of forming the egg-galleries and depositing eggs, station themselves at the entrance, where they die at their maternal post of duty, their dead bodies forming as effectual a barrier against the entrance of certain enemies as if living.

The male *Xyleborus celsus* is evidently identical with Leconte's *X. biographus*, as was thought probable by Eichoff.

The Willow Leaf Beetle, *Lina lapponica*, was exceedingly common during the early part of the season, completely defoliating all kinds of willows in some sections of the State, and often doing serious damage to the foliage of certain cultivated poplars. Spraying with Paris green was recommended for the protection of cultivated willows and poplars.

Pines Exempt from the Attack of D. frontalis.—I have not, as yet, been able to find a single living example of *Dendroctonus frontalis* in the State since the fall of 1892. Thus, no opportunity has been offered to continue the experiment with the imported *Clerus formicarius* as an enemy of this species, as was intended. The sudden and apparently utter disappearance of *D. frontalis* over an area of some ten to fifteen thousand square miles, where it had occurred in such enormous and destructive numbers, is yet somewhat of a puzzle to me. What little evidence I have been able to obtain, however, points to a contagious disease, producing a widespread epidemic, as the only logical explanation of the phenomenon.

Last spring I received some pine bark from North Carolina, which had been taken from one of many pine trees that had recently died. This bark bore the unmistakable evidence of the work of *D. frontalis*, and an example of the species was found in the bark. The fact that the species is living in that section of the great pine belt would indicate that it is only a matter of time when another invasion may be expected.

Diseases of Forest Tree Insects.—On Dec. 25th, 1895, while cutting in a decaying beech log in search of the larva and imago of a large Buprestid, *Chalcophora campestris* (?), I found that large numbers of the larvæ and pupæ had been attacked and were completely enveloped by a white, fluffy fungous growth, resembling closely the description of Prof. Luggers *Isaria tomicii*. It was also found that this fungus had attacked and killed other insects that infested the log, including larvæ, pupæ and adults of the common Tenebrionid, *Nyctobates pennsylvanica*, and imagoes of the Scolytid, *Platypus compositus*. Apparently the same fungus was also found in the entrance to the brood-galleries of *Xyleborus celsus*, in hickory, which were filled with a brood of living beetles. The fungus had apparently crowded back the guarding female into the secondary galleries, where it, with other examples of the brood, appeared to be hopelessly imprisoned, since they did not appear to be able to emerge through the leather-like substance of the fungus.

PTEROPHORIDÆ.—Prof. C. H. Fernald, of the Agricultural College, Amherst, Mass., who recently published a valuable monograph upon the Crambidiæ of North America, is now engaged upon a similar work on the Pterophoridæ, and would like to obtain materials from all quarters. He prefers that specimens should be sent to him pinned and spread, not in papers.

SOME NEW NEMATIDS.

BY C. L. MARLATT, U. S. DEPT. AGRIC., WASHINGTON, D. C.

The following descriptions of sawflies belonging to the subfamily Nematinae include, with one exception, a number of species which have been reared from the larvæ by Mr. H. G. Dyar. Mr. Dyar is anxious to publish the descriptions of the larvæ, and the technical descriptions of the species presented herewith are made to enable him to assign his larvæ to described species and avoid the difficulties which would arise from the description of larvæ before the adult insects have been characterized. The very valuable work which Mr. Dyar is doing in rearing larvæ is resulting in the clearing up of some puzzles in the classification of insects, and has no more interesting outcome than the fact that many of his rearings, at least in the line of sawflies, prove to be of species hitherto undescribed, showing how little we really know of the insects of this group in this country. The adults of most sawflies rarely leave their food-plants, and live but a few days, and hence it is not at all to be wondered at that so many species occurring on common plants have not been taken by collectors. The collected species, in fact, are usually only those which happen to frequent flowers and those taken by random beating, which, with insects of quick flight, like many sawflies, is not a very successful method of collecting. A vast deal of work will have to be done on the lines followed by Mr. Dyar before anything like an adequate knowledge of our insects in this family will have been gained. These species are additions to the recent revision of the Nematinae, published by the Department of Agriculture, as Technical Bulletin No. 3 of the Division of Entomology, and are described in conjunction with the tables and descriptions therein contained, so that the affinities of these additional species may be easily recognized.

Camponiscus americanus, n. sp.

Female.—Length, 6 mm.; a short, robust species; head broad, as wide or wider than thorax; clypeus deeply circularly emarginate; lobes broad, rounded; walls about ocellar basin sharply defined; frontal ridge strong, bulbous, unbroken; fovea broad, deep; antennæ short, tapering, smooth; joints three and four subequal, or three slightly longer than four; venation normal for genus; third cubital cell of left wing divided by a cross vein; claws bifid; teeth not very long, stout; sheath obliquely tapering on lower margin, fringed with short hairs; cerci long, strongly tapering. Colour reddish-yellow; antennæ dark brown above,

except at tip; small spot, including ocelli, tip of scutellum, meso-post-scutellum, and central area of metathorax, hind coxæ and base of abdomen beneath, dark brown; more or less of meso-epimera, femora, especially hind pairs, and tips of hind tibiæ and hind tarsi, brownish or infuscated; veins light brown, with yellowish hyaline portions, especially towards base of wings; stigma very broad, yellowish hyaline.

Male.—Length, 5 mm.; much more slender than female; antennæ more robust, compressed, not relatively much longer than antennæ of female; third cubital cell of anterior wings subject to much variation, bordering cross lines sometimes almost touching each other. Colour reddish-yellow and black; upper edge of antennæ, including all of two basal joints, large spot surrounding ocelli, lateral lobes of mesonotum, scutellum, metathorax, and abdomen, for the most part dorsally, together with spot on pectus and base of abdomen ventrally, with bases of posterior coxæ, brownish-black; legs uniformly reddish-yellow; hind tarsi slightly infuscated; veins little darker than in female; stigma yellow hyaline or very slightly infuscated about margin.

Described from two specimens, male and female, reared by H. G. Dyar, from larvæ on poplar, taken at Jefferson, N. H. This species is the first representative of the genus *Camponiscus* found in America. It seems to be distinct from any European species, and is a very interesting addition to our insect fauna.

A female of this species was also received for identification from Mr. Alex. McGillivray, collected at Franconia, N. Y. This specimen measures 8 mm., and presents a rudiment of a marginal cross nerve. The metathorax and the venter of the abdomen basally, as also the hind tibiæ and tarsi, are unicolorous with the body.

Pteronus ostryæ, n. sp.

Female.—Length, 6 mm.; moderately robust; clypeus very broadly circularly emarginate, lobes small; pentagonal area with distinctly elevated limiting walls; crest unbroken; fovea deep, triangular; antennæ long, tapering, third and fourth joints subequal; sheath short, rather robust, regularly tapering; claws deeply and evenly cleft; venation about normal; upper discal cell of hind wings considerably exceeding lower; stigma broad, regularly rounded on lower margin. Colour for the most part light greenish-yellow; antennæ, compound eyes, large spot, including ocelli and extending back over occiput, lobes of mesonotum and metanotum and base of dorsal sclerites of abdomen centrally, apex of

sheath, apex of hind femora, distinctly defined apical two-thirds of hind tibiae, hind tarsi and large spot on upper angle of meso-epimera, black or dark brown; wings hyaline; veins, except costal, brown; stigma brown.

Described from a specimen reared by H. G. Dyar, from a green larva (edge eater?) supposed to have come from hornbeam (*Ostrya americana*) taken in New Jersey. This species is closely allied to *P. odoratus*, Dyar.

Pontania terminalis, n. sp.

Female.—Length, 4 mm.; not very robust; shining; clypeus very shallowly, broadly emarginate; vertex with scarcely distinguishable pentagonal area, smooth or with ridges rounded, subobsolete; fovea shallow; antennae with third joint slightly longer than fourth; venation about normal; outer veins of discal cells of hind wings interstitial; stigma not very broad, tapering regularly to tip; claws large, deeply cleft; sheath narrow, regularly tapering, or slightly emarginate on lower edge; cerci short. Colour black, shining; apex of clypeus, other mouth-parts, angles of pronotum, tegulae and legs, for the most part, light yellow; extreme bases of coxae and hind tibiae and tarsi brownish-black; wings hyaline or nearly so; veins, including all of stigma, strongly infuscated.

Male.—Length, 3.5 mm; much more slender than female; structure as in female; antennae slightly more robust and with shorter joints; colour as in female, except venter, which is reddish-yellow, more or less infuscated, especially on the lateral area.

Described from three females and two males reared by H. G. Dyar, from imperfect galls in the partly-rolled terminals of willow leaves. Specimens collected near New York City. Types in Coll. U. S. Nat. Mus., and collection of H. G. Dyar.

This species is somewhat closely allied to *Pontania hyalina*, but differs in important characters and distinctly in the habit of the larva in partly rolling the leaf and formation of imperfect gall.

Pontania populi, n. sp.

Female.—Length, 5 mm.; robust; shining; clypeus deeply emarginate; lobes somewhat pointed; labrum with rather long yellowish hairs; ridges about ocellar basin sharply defined; frontal crest stout, unbroken; fovea oval; antennae short, moderately robust, third joint a little longer than fourth; venation normal, except that the second recurrent is very near the second transverse cubital, and the outer veins of the discal cells of hind wings are interstitial or nearly so; claws deeply and

evenly cleft; sheath elongate, narrow, regularly tapering; cerci very slender and elongate. Colour black, shining; apical half of clypeus and other mouth-parts, broad outer angles of pronotum, tegulæ, and legs, for the most-part, light yellow; posterior tarsi slightly infuscated; extreme base of coxæ, especially posterior pair, brownish-black; venter of abdomen yellowish, strongly infuscated; wings hyaline; veins, including all of stigma, dark brown.

Described from a single female, reared by H. G. Dyar, from larva collected in New York. This species is related to *Californica*.

The larva is practically the same in habit as *P. terminalis*, except that it is a different colour and lives on *Populus grandidentata*.

Amauronematus azaleæ, n. sp.

Female.—Length, 7 mm.; rather slender; clypeus very broadly and shallowly emarginate; frontal crest very strongly raised, bulbous, unbroken; walls about ocellar basin distinctly defined, not very prominent; fovea shallow, elongate, oval; antennæ short, tapering, fourth and fifth joints longer than third; claws deeply cleft, rays subequal; sheath pointed, with distinct scopa near tip; cerci long, slender, nearly filiform; venation normal; stigma narrow, strongly acuminate. Colour dull black and pallid white, the latter restricted to face below antennæ, orbits, pronotum, tegulæ, and entire venter except meso-epimera and sheath, more or less of the margins of some of the basal dorsal sclerites and lateral edge of all of dorsum of abdomen, including the sides of the large clasp-ing terminal arc, also pallid; legs slightly infuscated on upper and lower edges of femora, tibiæ and tarsi; hind tarsi altogether infuscated; wings hyaline, veins dark brown, including all of stigma.

Male.—Length, 5.5 mm.; slender; structurally about as female. Colour the same, except that the abdomen is black above and the lateral area of the ventral sclerites is strongly infuscated; the pronotum is also more or less black near the anterior edge, and the extreme base of coxæ, especially the hind pair, is more noticeably infuscated.

Described from two specimens, male and female, reared by H. G. Dyar, from larvæ collected at Jefferson, N. H., on Azalea. The female of the species is very near *oregonensis* in colour, but differs in the darker stigma and wing veins, and in the infuscated terminal dorsal arc of the abdomen.

Amauronematus similis, n. sp.

Female.—Length, 9 mm.; rather slender, graceful; surface of head and thorax finely punctured, opaque; abdomen smooth, shining; insect clothed with very short fine whitish pubescence; clypeus narrowly, rather deeply, emarginate; lateral walls about ocellar basin rounded; frontal crest deeply broken by backward extension of deep elongate antennal fovea; antennæ short, tapering, third joint shorter than fourth or fifth; claws evenly and deeply notched; sheath elongate, slightly tapering, rounded at tip; cerci filiform, nearly as long as metatarsal joint of hind foot. Colour black; triangle beneath antennæ, clypeus, labrum, cheeks, base of mandibles and wide angles of pronotum, yellowish-white; labium and palpi greatly protruding, black; anterior faces of fore legs, from the middle of femora downwards, yellowish infuscated; venter of abdomen, except apex, yellowish, especially on lateral margin, with base of segments strongly infuscated and all very much obscured with brownish-black; wings hyaline or very slightly clouded near veins; veins and stigma black.

Described from a single female reared by H. G. Dyar, from larvæ on willow, collected at Jefferson, N. H.

This species is closely allied in general appearance to my *A. Comstocki* and *A. gracilis*, but differs in important colorational characters, and seems intermediate between the two. It may be that ultimate rearings will show that all three of these species, now apparently distinctly differentiated, are merely varieties or indicate wide seasonal or local variations.

Amauronematus Dyari, n. sp.

Female.—Length, 6 mm.; robust; head and thorax opaque; clypeus shallowly emarginate; walls of ocellar basin wide, rounded, frontal crest distinctly broken; antennal fovea circular, with branches extending over base of antennæ; antennæ short, moderately robust, joints not at all nodose at tips, 3–5 subequal; venation about normal; stigma rounded on lower margin, not tapering; sheath tapering, obtusely pointed, clothed with short and rather dense hairs; claws deeply and evenly cleft. Colour resinous-yellow, with the thorax and head reddish; antennæ, narrow ring about each ocellus, meso-postscutellum, black; meso-scutum and more or less of centre of basal plates brownish; tips of posterior tibiæ and their tarsi slightly infuscated; wings hyaline, veins light brown, stigma and costa yellowish hyaline.

Male.—Length, 5 mm.: not robust, approaching slender; clypeus much more distinctly emarginate than in female; character of vertex and antennæ about as in female; procidentia very short and broad, more than twice as wide as long; venation and claws as in female. Head, for most part, and thorax and abdomen above, black; face below antennæ white; most of pronotum, the tegulæ and the venter, with legs, resinous-yellow; pro-episterna, and base of meso-epimera, brown; abdomen slightly smoky beneath; posterior tibiæ and their tarsi slightly infuscated, wings hyaline, veins brown, stigma and costa hyaline, former darker basally.

Described from two bred females and two bred males in Coll. of H. G. Dyar. This species is closely allied to *brunneus*, and was briefly described by Mr. H. G. Dyar (including a careful description of the larvæ), from six males and four females under Norton's species, *Nematus monochroma*, from which, however, it is unquestionably distinct. The larvæ are gregarious edge-feeders on poplar, somewhat resembling the larvæ of the common willow sawfly (*Pteronius ventralis*) in appearance and habit [see CAN. ENT., XXVI., page 187, 1894].

Pachynematus gregarius, n. sp.

Female.—Length, 4.5 mm.; not robust, surface shining; head distinctly narrowing back of compound eyes; clypeus broadly and shallowly emarginate; pentagonal area depressed, limiting ridges low, rounded; frontal crest unbroken, not prominent; antennal fovea shallow; antennæ short, slender, scarcely tapering, third joint distinctly longer than fourth; sheath short, obliquely truncate, pointed at tip; first transverse cubital hyaline or subobsolete; upper middle cell of hind wings considerably exceeding lower; stigma broad, rounded on lower margin, not tapering; claws with inner tooth remote from apex. Colour brownish-black and resinous-yellow; antennæ, head and dorsum of thorax and abdomen for the most part, sheath and upper half of meso-epimera, dark brown; mouth-parts, tegulæ, outer one-half of pronotum, legs and venter, together with lateral margin of dorsum of abdomen and terminal dorsal sclerites, yellow; light area of epimera and pronotum slightly infuscated; wings hyaline, stigma and nervures light brown.

Male.—Length, 4 mm.; structurally as in female, except that the ridges about ocellar basin are more sharply defined; procidentia narrow, tapering, pointed at tip; antennæ, large spot on vertex about ocelli and extending over occiput, thorax above except pronotum and tegulæ, and central dorsal area of abdomen (paling towards tip), brownish-black;

balance of insect resinous-yellow, except slight dark spot beneath wings.

Described from one female and one male bred by Mr. H. G. Dyar, from larvæ taken on willow in New Hampshire and New Jersey. The larvæ are described as resting flatly on the surface of the leaves, which they skeletonize, and as being gregarious and, in appearance, shining like a slug.

Types in Coll. U. S. Nat. Mus.

Pachynematus pubescens, Marlatt.

Male.—Length, 8 mm.; elongate, slender; head and thorax densely clothed with long sordid yellowish hairs; clypeus shallowly emarginate, strongly transversely keeled; ridges about ocellar basin distinct, but slight; crest not prominent, unbroken; fovea oval; antennæ very long and slender, joints nodose at tips, fourth and fifth longer than third; third cubital and second recurrent, and outer veins of discal cell of hind wings interstitial; third cubital cell large, divaricating apically; stigma long, narrow, tapering; procidentia wide, tapering, truncate at tip; inner tooth of claw very minute. Colour black, shining, including all of head, with mouth-parts, pronotum and tegulæ; apical half of hypopygium, apices of femora, and the tibiæ and tarsi, reddish-yellow, infuscated; genitalia pallid; wings hyaline, veins brown, stigma yellowish, usually with a brownish tinge, much darker than stigma of *apicalis*.

Described from six specimens from Cornell University, collected on Mount Washington, at an elevation of 5,500–6,000 feet. July 9th, 1891. In structural and colorational characters the male of this species is very close to the male of *extensicornis*, but is readily distinguished by the remarkable hirsute clothing of the head and thorax.

The female of this species was described in my Revision of the Nematinæ of North America. (Tech. Ser. No. 3, U. S. Dept. Agric., Div. Ento., 1896, p. 100.)

Hemichroa laricis, n. sp.

Female.—Length, 5.5 mm; robust; shining; clypeus broadly, shallowly, emarginate, and with strong transverse ridge near base; pentagonal area distinctly defined; ridges somewhat rounded; fovea shallow, circular; antennæ very slender, filiform, fourth joint much longer than third; sheath short, rounded at tip; cerci short; claws simple, without inner tooth; venation normal. Colour black; mouth-parts scarcely paler than the general body colour, or very slightly reddish; tegulæ and legs

pallid, strongly infuscated; coxæ black; wings slightly infuscated; veins brown, stigma pale centrally.

Described from a single female reared by H. G. Dyar, from larva collected on larch.

Mr. Dyar states that this is identical with the larva referred to in the Fifth Report of the U. S. Entomological Commission, as No. 26 of larch insects, *Selandria* sp.?, page 901. Mr. Dyar's specimens were collected at Jefferson, N. H.

ASSOCIATION OF ECONOMIC ENTOMOLOGISTS.

EIGHTH ANNUAL MEETING, BUFFALO, N. Y., AUGUST 21-22, 1896.

The Association was convened in the Lecture Hall of the Library Building, Buffalo, N. Y., and its meetings were attended by some nineteen active members, including the following officers: President, C. H. Fernald; Vice-president, F. M. Webster; and Secretary, C. L. Marlatt. The Entomological Society of Ontario was represented by the Rev. C. J. S. Bethune and Dr. James Fletcher. A number of entomologists not members of the Association were also present, with other zoologists, the number of persons present at the meetings averaging about thirty.

The following new active members were elected:—

W. G. Johnson, College Station, Md.

E. E. Bogue, Stillwater, Okla. Ter.

James S. Hine, Wooster, Ohio.

C. W. Mally, Wooster, Ohio.

H. L. Frost, Boston, Mass.

M. F. Adams, Buffalo, N. Y.

Lewis Collins, Brooklyn, N. Y.

W. E. Rumsey, Morgantown, W. Va.

The following new foreign members were elected:—

Chas. P. Lounsbury, Department of Agriculture, Cape Town, Cape of Good Hope.

Fred. Enock, 21 Manor Gardens, Holloway, London, England.

Dr. Enzio Reuter, Fredriksgatan, 45 Helsingfors, Finland, Russia.

Frederick B. Theobald, Wyecourt, Kent County, England.

Dr. Antonio Berlese, R. Scuola Superiore de Agricoltura, Portici, Italy.

Dr. Paul Marchal, 16 Rue Claude Bernard, Paris, France.

W. C. Grasby, Parkside, Adelaide, South Australia.

The active membership of the Association now numbers eighty-six, and includes practically all the leading workers in economic entomology in the United States and Canada. The foreign membership numbers twenty-nine, and comprises the leading official economic entomologists of the world.

A number of resolutions were passed ; among others, the following : Resolutions (1) relating to the death of Dr. C. V. Riley, the originator and first president of the Association ; (2) urging the publication by the U.S. Department of Agriculture of a general index to the seven volumes of *Insect Life* ; and (3) recognizing the importance of the work being done by the State of Massachusetts in the control of the gypsy moth, urging the continuance by the State of work in this direction and expressing the greatest confidence in the officers now charged with it.

The annual address of the President, Mr. C. R. Fernald, Professor of Entomology, Massachusetts State Agricultural College, Amherst, Mass., was entitled "The Evolution of Economic Entomology," and was devoted to a historical resumé of the progress in the practical control of insects from the earliest times to the present. The following papers were read and discussed :—

"Some Temperature Effects on Household Insects."

"On the Futility of Trunk and Crown Washes for Elm Leaf Beetle."

"Remarks on Steam Spraying Machines."

By Dr. L. O. Howard, Chief of Division of Entomology, U.S. Department of Agriculture, Washington, D.C.

"Three Years' Study of an Outbreak of the Chinch Bug in Ohio."

"Insects of the Year in Ohio."

By Prof. F. M. Webster, Entomologist to the Ohio Agricultural Experiment Station, Wooster, Ohio.

"A New Insecticide."

By A. H. Kirkland, Assistant to the Gypsy Moth Committee, Malden, Mass.

"Comparative Tests with New and Old Arsenicals on Foliage and with Larvæ."

"Insecticide Soaps."

By C. L. Marlatt, First Assistant, Division of Entomology, U. S. Department of Agriculture, Washington, D.C.

"Enemies of the San José Scale in California."

By Dr. J. B. Smith, Entomologist to the New Jersey Agricultural Experiment Station, New Brunswick, N.J.

"Insect Enemies of Forest Trees."

"Notes on Some Observations in West Virginia."

By Prof. A. D. Hopkins, Entomologist to the West Virginia Agricultural Experiment Station, Morgantown, W. Va.

"Notes on Insect Attacks of the Year."

By Dr. J. A. Lintner, State Entomologist, Albany, N.Y.

"Entomological Notes from Maryland."

By W. G. Johnson, State Entomologist, College Station, Md.

The following papers, the authors of which were not present, were read by title, but, it is expected, will be included in the published proceedings of the Association:—

"The Grasshopper Disease in Colorado."

By C. P. Gillette, Professor of Zoology in the State Agricultural College, Fort Collins, Colo.

"The Development of the Mediterranean Flour Moth."

By F. H. Chittenden, Assistant in Division of Entomology, U. S. Department of Agriculture, Washington, D.C.

"Notes on the San José Scale."

By W. B. Alwood, Vice-director of the Virginia Agricultural Experiment Station, Blacksburg, Va.

"A New Garden Smynthurid."

By F. L. Harvey, Professor of Entomology in the Maine State College, Orono, Maine.

"A Simple Device for the Preparation of Oil Emulsions."

By H. A. Morgan, Professor of Entomology in the Louisiana State University, Baton Rouge, La.

The following officers were elected for the ensuing year: President, F. M. Webster; first Vice-president, Herbert Osborn; second Vice-president, Lawrence Bruner; Secretary, C. L. Marlatt.

In accordance with the established custom, the next session will be held on the two days preceding the general sessions of the American Association for the Advancement of Science, Detroit, Mich., August 6-7, 1897.

C. L. MARLATT,
Secretary.

NOTES ON COLEOPTERA—No. XII.

BY JOHN HAMILTON, M.D., ALLEGHENY, PA.

Liparocephalus cordicollis, Lec.—This species does not differ in any way from *L. brevipennis*, Mæk., except in its pale colour, and the two forms must be united, as intimated in a former paper (CAN. ENT., XXIV., 158). Since the publication of that paper more than thirty examples of *brevipennis* and several of *cordicollis* have been examined and compared. Apart from colour, not a single character of general applicability has been observed by which to separate them into species. The synoptic characters given by Capt. Casey (Ann. N. Y. Acad. Sci., VII., 354) are without value otherwise than as descriptions of those of some individuals. When a sufficient number of each form is present, all the elements, without exception, tabulated by him to differentiate *cordicollis* exist in examples of *brevipennis*, and the reverse.

L. brevipennis is very variable in most of its structural parts (length of antennæ, width of head, form of thorax, etc.), for which due allowance must be made, or about four species created.

It may be observed that Dr. Leconte described *cordicollis*. He had seen only one example from the sea coast of California, and one of *brevipennis* from Unalashka, both of which, from his remarks, were evidently extremes, such as now exist. The pale colour of *cordicollis* may be from immaturity, just as in other dark *Staphylinidæ*, or it may be permanent, as occurs in variations of *Cryptobium bicolor*, *Belonuchus formosus*, etc. Rev. J. H. Keene, Massett, Queen Charlotte Islands, to whom I am indebted for such ample material, writes that he takes both forms together on the beach under rubbish in early spring, while later the pale form is not so often seen.

Tachinus Schwartzi, Horn, is by no means a common insect, and is mentioned here to record its occurrence in the mountainous parts of Western Pennsylvania. I took several examples recently in Forest County, in the pine region, from a decaying boletus growing on a pine log. It may readily be known by its black colour, elytra longer than wide and with distinct traces of sulci; the last joint of the antennæ, the four basal, and the legs, rufous; the sixth ventral segment of the male is deeply and widely emarginate, and in front of the emargination concave to the base and finely punctate, but without granulations. It was described from examples taken near Detroit, Michigan, and is known from Canada.

Trogoderma tarsale, Mels.—The larva of this species is unfavourably known as an occasional museum pest, and is generally supposed to live solely on animal matter, which it undoubtedly prefers; but it can likewise live on vegetable food as well, as the following demonstrates: A few packed figs were placed in a paper sack and securely tied and placed in a trunk while in Florida, in May, which was not opened till May of the next year, when the figs were found infested by the larvæ and pupæ of this species, while over sixty recently disclosed beetles were taken from the sack. Possibly in this instance the parent beetle may have accidentally been inclosed with the figs, and may not have from choice selected them as suitable food for her offspring, but it is in demonstration that this species can propagate itself on either animal or vegetable products.

The larvæ are more readily distinguishable from those of *T. ornatum* than are the beetles themselves; those of the latter have the last three abdominal segments dark; in the former some have the last three dark, with a spot on each side of the preceding two; some with the last and a spot on each side of the preceding two, dark, while one is occasionally seen entirely pallid. Both species pupate within the larval skin wherever it may be convenient.

Corymbites elongaticollis, Ham.—I find that this species is placed in some collections as *caricinus*, Germ., to which it bears considerable resemblance. It has been, as yet, taken but rarely in Western Pennsylvania, but appears to be more common in Canada, where I have likewise taken it. I have not seen an example of the true *caricinus* from the region eastward from the Mississippi, and I strongly doubt its existence there. Any comparison between the two species must be made with *caricinus* from the Pacific Coast. Several obvious differences will be observed: in *caricinus* the front is prolonged and much depressed at middle like in *Asaphes*, the depressed portion being smooth and with a few coarse punctures; in *elongaticollis* the front is distinctly and uniformly elevated, more or less transversely concave and densely punctate; in the former the thorax is less depressed, uniformly rather densely and coarsely punctured, the punctuation of the latter being comparatively fine, sparse on the middle, denser on the sides; in *caricinus* the elytral intervals are less convex and therefore apparently wider. Many other differences exist—difficult to make plain in print to such as have not both forms, useless to such as have. No one having both would for a moment proclaim them the same species. Whoever united *umbricola*, Germ., with *caricinus*.

could not have had good material of both forms before him or such a bad mistake would not have likely occurred. I have good material of the former from Vancouver and from Queen Charlotte Islands, and of the latter from Queen Charlotte Islands, and their union cannot be entertained when compared.

Agrilus macer, Lec., seems to be rare. It was described from Texas (Eagle Pass); one male occurred here five years ago, but it has not been taken since. If Dr. Horn's and Dr. Leconte's examples were ornamented with pubescence, it is not clearly set forth; in that taken here, on each side of the thorax above is a broad marginal band of white pubescence; the sternal side pieces, the vertical portion of the ventral segments, and a large spot on each side of each of the ventral segments, white, as in *difficilis*, from which it may at once be known by the furcate or emarginate projecting carina of the pygidium. In this sex the elytra are acute at tip as well as rounded and serrate, just as in *difficilis*. I have observed no other record of distribution than the above, but quite likely it is mixed in collections with *difficilis*.

Phyllodecta vitellinæ, Linn.—This species is recorded from Canada, Michigan and New Hampshire. No American examples have been seen, and there is strong presumptive evidence that *vulgatissima*, Linn., is the species so determined by Kirby; in his time, in Britain, the latter species was placed as a synonym of *vitellinæ*, and of course he would give the same name to the American examples. *Vulgatissima* is common in the regions mentioned, but no example of the other species is known. The two species are difficult to separate, even with the insects in hand, and it is more so to make an intelligible description of their differences. In both species the colour of the upper surface is equally variable—green, violet, purple or bronze; the surface of the thorax is a little uneven, sparsely irregularly finely punctured on the disc, more densely toward the sides; the elytra are serially punctured in undulating rows of fine, close-set punctures; these rows are usually much confused before the apex and at the sides; the intervals are usually impunctate. The differences at first sight are not very evident, the chief being the more elongated form of *vulgatissima* and the carination of the lateral elytral interval; *vulgatissima* is .19 inch. in length; *vitellinæ* .17 inch., with the width of the former and a little more convexity, which gives it a more robust appearance. The carination of the lateral elytral interval used by European authors to divide the genus into sections is not a very evident character;

by a careful examination may be seen a row of fine punctures next the margin, separated from the general surface of the elytron by a more or less sharp line, while in *vitelline* this row of punctures is more or less obsolete and not sharply separated from the confused punctuation of the contiguous surface. A little faith is sometimes required to see these differences. It would be useless to enter into more minute details, as anyone who cannot identify his insects by those given would probably fail with both species in hand. If *vitelline* occurs in North America, the above may be sufficient to cause its recognition.

P. interstitialis, Mann.—This species was described from the Yukon, from a single example, and is usually set down by American writers as a synonym of *vulgatissima*, the type being considered as perhaps deformed. The description seems, however, to forbid such an assignment, as, in addition to the usual stria arrangement, the whole of the elytral surface is represented as deeply and coarsely punctured. I have examined many specimens of the American and European *vulgatissima*, and likewise of the European *vitelline* and *cavifrons*, in all of which the intervals are practically impunctate, and show no tendency to become punctured in any degree. *Interstitialis* by description is a valid species.

Amblyderus (Anthicus) pallens, Lec., was described from examples taken on the shores of Lake Superior; a form taken on the sea coast of New Jersey, and southward, by others as well as myself, seemed from description to be the same, but it is only recently that I have been able to be assured of their identity by direct comparison of specimens. Mr. Wickham has kindly sent four examples from the southern shore of Lake Superior, between which and those from the Atlantic Coast there are seemingly no differences except those of individuality. Of those sent by Mr. Wickham, one is entirely pallid throughout, one has the abdomen partly fuscous, another entirely so, and the fourth has in addition the elytra pale livid, indicating that there may be a melanotic form. Of six sea-shore forms, two are entirely pallid, the other four have the abdomen infusate and one of them also the elytra slightly. Inasmuch as the original description is out of print, its reproduction may be useful on account of the redescription by Capt. Casey in his recent revision of the *Anthicidæ* being so seriously defective as to be misleading, describing the entirely pale and exceptional form not mentioned by Dr. Leconte, but giving no hint of the common form with the fuscous abdomen—Leconte's species,

"Testaceous, convex, pubescence white, eyes black; head triangular, base emarginate with the angles acute, a smooth longitudinal line, moderately punctate; thorax not narrower than the head, shorter than wide, obovate, obsolete canaliculate, rather densely punctate; elytra very finely punctate, apex subtruncate; abdomen dark fuscous (*nigro-fusco*). Length, .11 inch."—[TR.] Agassiz, Lake Superior, p. 231. Supplementary characters were added (Proc. Acad. Nat. Sci., Phil., 1852, p. 103): "Head sparingly granulato-punctate, thorax very strongly narrowed posteriorly; elytra convex, truncate at base; antennæ slender and long, terminal spurs of tibiæ very distinct, those of anterior tibiæ very unequal, the anterior tibiæ of the male slightly sinuate internally and the terminal spine more prominent." The elytra do not cover the abdomen. The pallid examples occur on the coast among the hills of white sand immediately fronting the ocean, and I took one on the beach of Anastasia Island, Florida; those with dark abdomens, a little further back at the base of those bordering on the salt meadows.

Under the name *A. arenarius*, Capt. Casey has described from a unique taken at Newport, Rhode Island, what seems to be the form of *pallens* with the fuscous abdomen, as described by Dr. Leconte.

MISCELLANEOUS NOTES.

Stagmomantis carolina, Linn.

In his index to the Mantidæ of North America (CAN. ENT., August, 1896, 211), Mr. Scudder gives the range of this species as "Florida to Arizona. . . . north to Maryland, Southern Illinois, Missouri, Kansas, and Utah."

He might also have included the southern half of Indiana, since it is common in the counties bordering on the Ohio River, and is occasionally taken as far north as the City of Indianapolis; specimens taken here (females, brown form) having been brought to me on Sept. 23rd and 26th, 1895, and Sept. 4th, 1896. I have also a green female from Mitchell, Lawrence Co. Mr. S. G. Evans, of Evansville, Ind., in a personal letter, says: "The Mantids are found here of all sizes and colours, the eggs and young being almost as common as mosquitoes. I have on several occasions placed male and female together in a glass jar, and the female always devoured the male, and generally while in the act of copulating, the bodies remaining together until the male was almost consumed."

Gonatista grisea, Fabr.

The specimen from Indiana mentioned by Mr. Scudder (*loc. cit.*)

was taken by Mr. Evans, at Evansville. As he thought it to be a short-bodied form of *S. carolina*, he has no recollection of the exact date or place in which it was found.

Acanthosoma cruciata, Say.

Mention of this handsome member of the family Pentatomidæ occurs in but few of the published lists of Heteroptera. This is probably not so much due to its scarcity as to an ignorance of its food-plant and habitat. In Indiana I have found it in abundance on several occasions, but always on the leaves and stems of Spikenard (*Aralia racemosa*, L.), growing on the sides of deep damp ravines. The mature insect may be taken during August and September.

Trichopepla semivittata, Say.

This is another uncommon Pentatomid, which appears to have a special food-plant. I have taken it but once, Sept. 9th, 1894, in Vigo Co., Ind., where I found it very common in all stages, on the heads, and in the angles of the leaves, of the plant known as Rattlesnake-Master, or Button Snake-root (*Eryngium yuccæfolium*, Michx.). The insect will probably be found wherever this plant abounds.

Libythea Bachmani, Kirtland.

This little butterfly, so readily known by its long, beaklike palpi and angled fore wings, is usually of rare occurrence in Indiana. This season, however, it has been very common, and has been noted in a number of localities in the State. On June 14th, eighteen specimens were secured from the flowers of some basswood trees (*Tilia americana*, L.), which stand in front of my residence, in a thickly settled portion of the City of Indianapolis.

Papilio philenor, L.

This butterfly is very common in Indiana, and for a long time I was puzzled as to its food-plant, the ones commonly mentioned in the books, *Aristolochia serpentaria*, L., and *A. siphon*, L'Her, being very rare in the State. The problem was solved one day, however, when I found the larvæ of *philenor* feeding upon the leaves of the wild ginger (*Asarum Canadense*, L.), a common plant along the rich hillsides of Central and Southern Indiana, and one which belongs to the same family as the different species of *Aristolochia*.

Indianapolis, Ind.

W. S. BLATCHLEY.

BOOK NOTICES.

THE GYPSY MOTH.—A report of the work of destroying the insect in the Commonwealth of Massachusetts, together with an account of its history and habits both in Massachusetts and Europe. By E. H. Forbush and C. H. Fernald.

This report, a handsome volume of nearly 600 pages, well printed and most copiously illustrated with chromolithographs, photogravures, and wood cuts, gives a full account of the introduction of the now notorious "Gypsy moth" into America by Leopold Trouvelot in 1868 or 1869, traces its history, and records the efforts which have been made to exterminate it by the State of Massachusetts up to the end of 1895. The spread of this insect for the first ten years was remarkably slow, in the light of what we now know of its capabilities for harm. During that period it was not noticed by anyone but the introducer. The first extensive outbreak was in 1889, but for ten years before that it had given great annoyance to the people living in the part of the town of Medford where it was first introduced. It had also spread and had gained a foothold in thirty townships without attracting public attention. Since that time its history is well known. In 1890 the first Gypsy Moth Commission was appointed and the work of fighting the pest was inaugurated. In February of the next year this commission was removed and another one substituted. On 12th of March, Mr. E. H. Forbush, the present very efficient Director of Field Work, was appointed, and on 18th June Prof. C. H. Fernald began his labours as Entomological Advisor. Since that time the work has been pushed on with great energy, and the present valuable report is an outcome of the combined efforts of a practical, energetic manager and a careful scientific entomologist. The two parts of this report, prepared by the above-named officers, are quite distinct and form together a very complete treatise, not only upon the Gypsy moth, but upon the general principles which it is necessary to study when combatting any injurious insect. This carefully-prepared report, therefore, cannot but be for a long time an indispensable book of reference for economic entomologists.

There are in this volume many things which will attract the attention of entomologists. Indeed, it is so full and there are so many different subjects treated of, that even to give the titles would take more space than is at my disposal. The first thing which will be noticed is the adoption of the generic name *Porthetria*. Articles of particular note deal with

the studies made as to the methods of distribution of the Gypsy moth, and the measures practised for the destruction of the insect in its different stages; spraying apparatus; and particularly the care of spraying machinery; methods of pruning; and some charming observations upon insect-eating birds.

The scientific work contained in Professor Fernald's report is of great value and contains a record of most painstaking and patient work. Probably one of the most interesting sections is that which deals with Natural Enemies, in which most excellent work has been done. Prof. Fernald has been aided in this work by efficient assistants, and the whole information so gained has been pieced together by a master hand.

With regard to spraying, some surprising results have been obtained. In the first place, the caterpillar of the Gypsy moth seems to be little affected by applications of Paris green when applied of the strength ordinarily used for other mandibulate insects. Mr. Forbush says: "It became evident before the end of the season of 1891, that spraying, while reducing the numbers of the moth, could not be relied upon as a means of extermination, for many caterpillars survived its effects."

The following conclusion, on page 139, will show entomologists that the matter of controlling mandibulate insects, by means of active poisons, is still a fertile field for careful work, in which useful and laurel-bearing results are still to be reaped:—

"Every effort was made during the spraying season to determine why the results of spraying were not uniform and satisfactory. The feeding caterpillars were watched day and night by many observers. The spraying was most carefully superintended, and the conclusion finally arrived at was that, under ordinary conditions, spraying with Paris green for the Gypsy moth was ineffective and unsatisfactory."

Paris green was on the whole the most fatal insecticide, and when used in the proportion of one pound to 150 gallons of water, did not burn foliage; but with larger proportions, did considerable harm. The injury developed so rapidly that within a short time the leaves were all killed and the surviving larvæ had to go elsewhere to feed. "Therefore, a strong Paris green mixture had little better effect than a weak one. Lime was then used with the Paris green, with a view of neutralizing the burning; but considerable injury to the foliage still continued."

Probably one of the most remarkable facts discovered by the entomologists is related by Prof. Fernald, on page 476, where he says: "One

interesting result obtained from the analyses of the different stages of the Gypsy moth made in 1893 and 1894 is that pupæ and imagoes from caterpillars which have been reared on leaves sprayed with Paris green or arsenate of lead may contain arsenic in recognizable quantities. Several pupæ and a few female imagoes obtained under these conditions, when subjected to chemical analysis, gave ample evidence of the presence of arsenic in their bodies. This shows that the presence of arsenic in the pupa may not materially interfere with the processes involved in the development of the imago. Since, as has been repeatedly demonstrated, moths reared from poisoned larvæ are capable of reproduction, it is also evident that the arsenic contained in their bodies does not injure the reproductive function." With reference to the amount of arsenic which could be consumed by some of these caterpillars, and yet leave them "normally active and healthy," it was found that some of them had in their bodies, in proportion to their weight, an amount equivalent to $12\frac{1}{2}$ times the fatal dose for an adult human being, in proportion to the weight of the latter.

The work of the Gypsy Moth Committee has been criticised, examined and studied by practical men who were entomologists and others who were not. As far as I can learn, the general verdict is that excellent work, and, under the circumstances, remarkably so, has been done. The insect is not exterminated, it is true; but there seems every reason to hope, judging from what has been done and the behaviour of the species in other countries where it was once alarmingly abundant, that this is possible if money be supplied and if it be given at the time when it can be made use of to the best advantage. On pages 38 to 93 of the report will be found an instructive account of the constant efforts of the committee to get funds to carry on the work properly, and year after year it was the same story of reduced, and what was almost worse, delayed, appropriations, resulting in the necessity of modifying the whole plan of work arranged for the year; so that instead of making vigorous efforts for the extermination of the insect, and fighting it at the time this could be most effectively done—early in the season when the caterpillars were small—all that could be done was to try and prevent the further spread of the enemy from the localities known to be infested. The appropriations which have been made for this work are considerable, about \$525,000 up to the present time, and this amount would certainly have produced far better results could the committee have obtained the grants

at the time they required them, so that they could have begun the work early in the season and continued employing, from year to year, those assistants who had been taught, at an expense of much time and trouble, what was required of them.

J. FLETCHER.

Mittheilungen aus dem Roemer-Museum, Hildesheim. No. 6.—Juni, 1896. DIE SATURNIIDEN (Nachtpfauenaugen), von A. Radcliffe Grote, A. M.

This paper of 28 pages is illustrated by three plates and eighteen cuts. The illustrations are from photographs of living moths and are remarkably fine. The author defines the superfamily Saturniides and gives a table separating the families and a number of genera. The value of this table is unfortunately vitiated by the curious spacing, which renders it practically impossible to follow it.

The Saturniides are divided into two families, and each of these into three subfamilies. The Endromidæ, Bombycidæ, and Lacosomidæ are shown not to belong to the group, principally on larval characters. The relations of the Sphingidæ are also briefly discussed. Following are remarks on parthenogenesis and hybridization in the group, a discussion of the subfamilies adopted, geographical distribution, nomenclature, certain corrections to the author's previous paper on the Apatelidæ, and a list of European and North American Saturnians.

No fault is to be found with the classification which the author has worked out, regarded as an artificial grouping. A certain character of venation is selected (position of vein IV_2 on primaries) and the groups referred strictly by this character. A natural classification, which should combine several such special ones, is not attempted. As compared with the reviewer's classification on larval characters, the position of the groups represented by Hemileuca and Aglia are transposed. Mr. Grote must, therefore, suppose that the larva of Aglia is derived from a Citheronia type independently of the Saturnia branch. The larva should have re-acquired the pair of anal tubercles which are already entirely lost in Citheronia, and lost the unpaired tubercle on joint 13. He must also suppose that the stinging spines have been twice separately evolved in the group. On the other hand, to reconcile his grouping with mine it is only necessary to suppose that vein IV_3 has moved toward IV_1 in Hemileuca separately from the types of Attacus and Saturnia, where this process is congenital.

HARRISON G. DYAR.

The Canadian Entomologist.

VOL XXVIII. LONDON, NOVEMBER, 1896.

No. 11.

BUTTERFLIES TAKEN AT ORILLIA, ONT.

BY C. E. GRANT.



FIG. 23.

I have been collecting Lepidoptera in Orillia and its vicinity for over thirty years, off and on, and thinking that it would be of interest to my brother collectors to have an idea of the fauna of this district, I send you a list of the diurnal Lepidoptera taken by me as far as identified.

Danais archippus.—Common from June 5th to October.

Argynnis atlantis.—Common from June 4th to August.

" *cybele*.—Common from June 16th to August 31st.

" *aphrodite*.—Not so common, from June 23rd to August. One specimen of *Argynnis* taken by me presented a very dark appearance, nearly black, on the basal portion of the wings, with a greenish tinge on the outside edge of dark base, supposed to be a melanic female of *cybele*.

Argynnis myrina.—Common; two broods, June and August.

Phyciodes tharos.—Forms *marcia*, *morpheus* and other varieties common May 24th to July.

Phyciodes nycteis.—Fairly abundant; one brood in June.

" *Batesii*.—One specimen taken in July.

Grapta interrogationis.—Forms *umbrosa* and *Fabricii* common. There are three broods here.

Grapta comma.—Forms *dryas* and *Harrisii* both fairly common.

" *progne*.—Common all the season.

" *gracilis*.—Two specimens taken in July on *Asclepias*.

" *faunus*.—Rare.

" *j. album*.—Common some seasons in September.

Vanessa antiopa.—Common.

Vanessa Milberti.—Common. I think there are three broods.

Pyrameis atalanta.—Usually common in spring. This year remarkably abundant in first week of August: Saw hundreds on August 6th; took six at one sweep of the net; since then have not seen one.

Pyrameis huntera.—Not uncommon in August.

" *cardui*.—Generally common. Have not seen any this year up to this date, August 31st.

Limenitis arthemis.—Not very common in June. Very few this year, but of remarkably large size.

Limenitis disippus.—Moderately common. Second brood in July and August in low lands.

Debis portlandia.—Two specimens taken near Coldwater, on Matchedash Bay, in August, 1883.

Neonympha canthus.—Common in low meadows in July.

" *eurytris*.—Very common in open woods in June.

Satyrus nephele.—Taken occasionally in July. Not seen of late years.

Thecla acadica.—Usually three or four in a season in July. Very plentiful this year. Took forty specimens.

Thecla titus.—Also common this season; usually rather scarce in July.

" *strigosa*.—Have taken one or two every season in July.

" *calanus*.—Rather rare in July.

Feniseca tarquinius.—Moderately common through the season in one locality.

Chrysophanus thoe.—Also very local, but not uncommon when their habitat is known. Two broods, end of June and end of August.

- Chrysophanus hypophleas*.—Common all the season.
- Lycæna pseudargiolus*.—*Lucia* very common in April and May. *Neglecta* not so abundant in July and August.
- Pieris oleracea*.—Spring type common in April and May. Summer form also. Have also taken *virginiensis*.
- Pieris protodice*.—Common years ago. One male taken last year in August.
- Pieris rapæ*.—Everywhere abundant.
- Colias eurytheme*.—Common in 1872; not seen here of late years.
- " *philodice*.—Abundant. Also albinic female occasionally.
- Meganostoma cæsonia*.—Quite common this year from June 6th to July 13th. Only one specimen taken before, about thirty years ago.
- Papilio turnus*.—Generally common in May, June and July; scarce this year. Have taken a specimen of a melanic male similar to one figured in CANADIAN ENTOMOLOGIST some years ago by Dr. Fletcher. (Fig. 23.)
- Papilio æsterias*.—Formerly rather common; now scarce.
- " *cresphontes*.—Has been taken in Orillia, but not by myself.
- Pamphila sabulon*.—Forms *hobomok* and *pocohontas* common in May and June; one brood.
- Pamphila mystic*.—Common in June and August; two broods.
- " *cernes*.—Very abundant in June. Second brood scarce in August.
- Pamphila peckius*.—Also common; taken in June and end of August.
- " *metacomet*.—Rather scarce in July.
- Nisoniades juvenalis*.—Not uncommon in May and June.
- " *icelus*.—Not uncommon in May, June and July.
- " *brizo*.—Scarce; two or three specimens.
- " *lucilius*.—Scarce.
- Eudamus pylades*.—Abundant end of May and June.
- " *tityrus*.—Not abundant, in May, June and July; and a specimen which I take to be *Eudamus bathyllus*, but of which I am not sure.
- Pholisora catullus*.—Taken sparingly in June.

This comprises all the local diurnals which I have found in this district, except one or two species of *Pamphila* which I am unable to identify, making fifty-three or fifty-four species. I have about 200 species

of Noctuidæ and 100 or so of Geometridæ, etc., but having had no chance of seeing other collections, from the present state of literature I cannot identify a great number.

I should like very much if some of your readers could give me the life-history of *Brephos infans*, particularly as to the time of flight. I have taken this rare moth when a boy, and knew enough to mention that it was caught "at birch trees in May," but neglected to note whether it was day or night, and I cannot remember now. I have several other rare captures, and some day might report them if you think it would interest your readers.

[NOTE.—*Brephos infans* is a day flier, and from its irregular flight, as well as its colour, is very difficult to follow. The larva feeds on birch.—ED.]

NOTES ON THE PREPARATORY STAGES OF EREBIA EPIPSODEA (BUTLER).

BY H. H. LYMAN, MONTREAL.

In Part IX. of the 3rd series of Edwards's Butterflies of North America is given a very full and beautifully illustrated history of this species from the egg to imago; but as I have bred this species during the summer of 1895, through all its stages, and as the life-history, as worked out by me, differs in certain important particulars from that recorded by Mr. Edwards, I think it advisable that I should give my experience in the rearing of this very interesting species.

On 4th of July I received from Mr. J. A. Guignard, Assistant Botanist and Entomologist of the Central Experimental Farm at Ottawa, a number of eggs which had been sent to Dr. Fletcher by Mr. T. N. Willing, of Olds, Alberta; Dr. Fletcher having left for an extended trip through the Northwest Territories and British Columbia. The eggs were hatching when received, and their colour could not, therefore, be ascertained. They had been sent on 24th June, and the egg period, supposing them to have been laid the day before they were mailed, would be, thus, 11 days. No intimation was given me as to the species, but I afterwards received from Mr. Guignard a specimen of *E. Epipsodea*, which had been sent along with the eggs, and was doubtless the one that laid them.

Egg.—Height, 1.66 mm.; diameter, .89 mm.; very much of the general shape of that of *C. Jutta*, as figured in Scudder's Butterflies of New

England, pl. 64, fig. 2. Slightly widest at one-third from base. Ribs about 22-24, well marked, but not very prominent, and with many cross ribs, as in Scudder's figure of that of *Satyrus Alope*, fig. 3 on the same plate.

Young Larva.—Head large, pale brownish, pitted with many small depressions, which are darker, and ornamented with a number of brown spots, which are arranged as follows: four on the summit, two near together towards the front, and two further apart behind, below these a row of six, and a few minute ones lower down; the ocelli black.

Body.—Length, 2.5 mm.; pale in colour, with a dorsal, three subdorsal, a lateral, and a subspiracular stripe of brown. Second segment has about ten minute tubercles in a row, some smaller than others, and one on each side in the subdorsal region in advance of the row. On each segment, from 3rd to 12th, inclusive, there are six small tubercles above, arranged $\cdot \mid \cdot$, and also several smaller ones on each side rather low down. All the segments except 2nd and 13th are divided by three transverse wrinkles.

On 10th several were seen to be swollen for first moult, but others continued to feed. On 12th ten were counted, and all but one seemed ready for first moult. In the evening one was seen to have passed the moult, several more passed on the 13th, and by the 14th all in sight had passed the moult, the average length of first stage being thus nine days.

After First Moult.—Length, 4.7 mm. Head rather large, exceeding the 2nd segment, brownish-green. Body tapering pretty evenly to anal extremity, which now terminates in two blunt points, as stated and figured by Edwards. The head is pitted as before and covered with clubbed tubercles. The body tubercles are very numerous, short, curved towards tail, and slightly clubbed. Towards the tail they get longer and are hardly clubbed. I could not discern any difference between those on the 2nd and 3rd segments. The tubercles are translucent brownish-green or pale in colour, and spring from brown spots. Body pale yellowish with a tinge of green. There is a dorsal stripe of dark brown, and a subdorsal and two lateral brown stripes, the lower being just above the spiracles. The next one above is wider than the others and diffuse on lower side. Spiracles are dark brown or black. The basal ridge is yellowish, and below it there is on the 5th to 12th segments, inclusive, a brown oblong spot, described by Edwards as a continuous stripe. Venter and prolegs brownish-green, speckled with brown dots; feet greenish.

Length of second stage about nine days.

On 21st July one was found to have passed second moult.

After Second Moult.—Length at rest, 7.8 mm. Processes innumerable. Shape as before, tail as before; head as before, very rounded, exceeding the second segment, light horn coloured, translucent, much pitted. Colour of body, yellowish-brown. A strongly marked dark brown or black dorsal stripe, bordered with creamy colour, three brownish lateral stripes, the upper one light brown, the middle one dark brown with a light brown shading below, the lowest one light brown and very little separated from the shading of the middle one. Spiracles small, ringed with brown. Subspiracular ridge strongly marked and below it a dark brown stripe. The sockets of the prop-legs and feet margined with brown. Venter, prop-legs and feet of same light horn colour as above, the feet and legs speckled with brown dots.

On 31st July one which had lagged very much was found partly past second moult, but dead; one still lingered, not having moulted; several were nearly ready for third moult. On 2nd August one was found just past third moult, and the second moulted on the 3rd.

Length of third stage was thus about twelve days.

After Third Moult.—Length, 11.46 mm. Edwards says .38 inch. Colour is greenish-brown, and the only difference I could see was that the upper lateral or subdorsal stripe is darker than before. The third larva moulted soon after 3rd August, and the fourth on 8th August and fifth on 13th August.

After third moult they increased very rapidly in size and became very plump, as I supposed, preparatory to hibernation, as Edwards described four moults, but I soon recognized that they must be about to pupate.

Mature Larva.—Length, 20.3 mm.; pale greenish-horn colour; tapers to both ends.

Head rather small, pale horn-colour, thickly and minutely pitted with brown. Dark brown dorsal stripe, bordered with creamy colour. The other stripes rather faded out and indistinct. Rather more than half way to the spiracles there is a creamy stripe margined below with brown and with a slight brownish atmosphere above. The spiracles are dark brown and very small, and just above them there is a pale creamy line. The subspiracular fold is strongly marked, but the dark line below it has almost disappeared and is only represented by a slight shading. Before

pupation the larva becomes of a rather dirty greenish-white colour, very plump, especially about the middle. The larva, when contracted for pupation, lies curved on its back among the grass without any attempt at spinning silk, just as Edwards figures it. First one pupated 15th Aug., the second on the 17th, the third on the 18th, the fourth failed to pupate and died, the fifth pupated on 29th.

The fourth stage was thus from thirteen to sixteen days.

Pupa, when first formed, is of a creamy colour, very similar to that of the grub of a *Tachina* fly when it has just emerged from the body of its victim before it contracts and hardens into the puparium. The brown markings appear in the course of an hour or two, and the description is then as follows:—

Pupa.—Length, 11.7 mm. Pale horn colour, streaked and spotted with dark brown; cylindrical; abdomen stout, conical, with a slightly curved, pointed tip. The abdominal segments are margined with brown, especially at the sides, and are also spotted with brown. The spiracles are orange. There are brown stripes in the interspaces of the wings, and the antennæ, tongue and feet-cases are also marked with brown.

The first pupa was seen to be black, and the wing markings showing on 27th Aug., and it emerged early on the 28th, and was a ♀; the one that pupated on 17th gave the imago, a ♀, on 29th; the one which pupated on 18th gave the imago on 30th, and the one which pupated on 29th Aug. gave the imago on 9th Sept.

The pupal period thus varied from thirteen to eleven days.

The average of the first three gives a period from oviposition to imago of from sixty-eight to seventy days.

The points in which my observations chiefly differ from those of Mr. Edwards are:—

First: As to the egg which Mr. Edwards describes as having thirty-five ribs, while my count gave in one case twenty-two and in another twenty-four, it was impossible for me to get all the eggs which I had into a position where the ribs could be counted, but I thought that two out of about a dozen should yield a fair average. It is true that there is variation in the number of ribs in the same species and even in the same individual, but the difference between twenty-four and thirty-five seems hard to account for.

Second: Edwards describes four moults, the larva hibernating after either second or third moult.

I think it quite possible that when the larva hibernates there may be a fourth moult, and it is probable that those of mine which completed their changes in one season had their stages hastened by being reared under more southerly conditions. Several of my larvæ fed comparatively slowly after third moult, as though trying to hibernate, but most of them died. The last was sent to Dr. Fletcher to see if he could carry it over the winter successfully, but it perished.

There can be no doubt of the accuracy of my observations, as I had only a few larvæ, which were under constant observation, and I preserved the cast faces, which give measurements as follows, according to the micrometer eye-piece of my microscope: 8, $12\frac{1}{2}$, $18\frac{1}{2}$, 28. These reduced to millimetres and decimals are as follows: .666, 1.041, 1.542, 2.333. As the faces were not of the same individual, but were simply taken at random from all those preserved, the measurements come as close to the theoretical progression as is to be expected.

I wrote to Mr. Willing to ask if he had ever noticed a second flight of *Epipsodea* at Calgary, as I thought it possible that there might be at least a partial second brood, but he replied that he had never noticed any such flight. Finding my experience so different from that described by Mr. Edwards, I consulted all the literature at my command to see if I could obtain any light on the questions of the normal number of ribs in the eggs and of moults in the larvæ of this genus, but with absolutely no success.

AELLOPOS TITAN (CRAM.).

In the CANADIAN ENTOMOLOGIST, Vol. XXIII, p. 41, Mr. Moffat records the capture of the above rare moth at Grimsby, Ont., and adds that it is possibly the only Canadian specimen in the country.

Another Canadian specimen of this visitor from the tropics was taken about four years ago at Cushing, P. Q., a village in the Ottawa Valley, not far from Lachute.

This specimen is now in my collection, and seems to be unusually large, expanding 2.6 inches. The discal spot of primaries is quite distinct. The transverse straight, whitish band only extends half across the wings, and consists of three rectangular spots, and the submarginal band consists of five large lunules. The terminal space is slightly paler than the rest of the wing, and there is no trace of the spots or bands.

Westmount, P. Q.

A. F. WINN.

THE GYPSY MOTH IN MASSACHUSETTS.

[A discussion on the work of its extermination, at the eighth annual meeting of the Association of Economic Entomologists, Buffalo, August 22nd, 1896.]

REPORTED BY A. H. KIRKLAND.

At the eighth annual meeting of the Association of Economic Entomologists, held at Buffalo, August 21st and 22nd, 1896, a part of one session was devoted to the consideration of the work of exterminating the gypsy moth in the Commonwealth of Massachusetts. The subject was presented for discussion by the President, Prof. C. H. Fernald, at the morning session of the second day. Prof. Fernald referred to the action of the Association at its Springfield (1895) meeting, and stated that at the legislative hearings of the past spring, held with reference to determining the size of the appropriation to be granted for continuing the work of exterminating the gypsy moth, no representations made by the Gypsy Moth Committee, the Director, or himself, carried a fraction of the weight that the endorsement of the Association afforded. The legislators recognized the Association as a body of eminent scientists, and accordingly valued the opinion of its members.

In speaking of the present condition of affairs brought about by the failure of the Legislature to provide sufficient funds for the continuance of the work in the most approved manner, the Professor stated that future action must be along one of three lines :

(1) To continue the work with a view to *extermination*. This can be done, but will involve a vast outlay.

(2) To attempt the *control* of the insect, but with no idea of its ultimate extermination. This means a great annual expenditure that must be continued indefinitely.

(3) To abandon the whole work, "let the insect spread at its own sweet will," and trust to the property owners to care for their own estates. Should this latter course be adopted, it would be impossible to say how long a period of time would elapse before the pest would spread over the whole of New England and into adjacent territory. The insect is now in a condition to spread rapidly through avenues of traffic, and its diffusion over the whole country would probably be a matter of comparatively short time.

The committee in charge, and those directly connected with the work, have been criticised because the importation of parasites has not been attempted. This, the Professor explained, had not seemed wise while the work has been carried on with a view to extermination, since

the latter condition involved the destruction of all large colonies wherever they occurred, and would thus prevent the successful breeding of parasites. Such insects would require the most favourable conditions in order to become acclimatized, and this would necessitate the preservation of large colonies of the gypsy moth as food for the parasites. Should the work of extermination be abandoned, a careful study of the natural enemies of the gypsy moth in its native home would be advised.

At the request of Professor Fernald, Director Forbush gave an account of the progress made in the gypsy moth work and its present condition. He said that when this insect, which was introduced into Massachusetts more than twenty-five years ago, first became seriously destructive, a commission was appointed by the Governor to "prevent its spreading and secure its extermination." This commission found that the territory infested by the moth was much larger than had been supposed. The commission was superseded the next season by another, which in a short time was abolished, and the work was then turned over to the State Board of Agriculture.

The work was begun under a grave misconception of the amount of territory infested. As soon as the State Board assumed the direction of the undertaking, it was found that the infested territory extended, not, as believed by the first commission, over a small and well-defined area, but, instead, over some thirty cities and towns. The size of the infested territory as considered by the first commission, compared with the actual area later found to be infested, was very aptly illustrated by the comparison of the size of a silver dollar with that of a broad-brimmed hat.

With a region of two hundred and twenty square miles to be examined and cleared of the moth, the appropriations made the first two years proved entirely insufficient to do more than to destroy the larger swarms of the insect and clear them from a few of the towns on the periphery of the region. The two years' work demonstrated, however, to those in charge that the moths could be cleared from any given territory provided ample appropriations could be secured to organize, equip and train a sufficient force of men. The season of 1892 was rather unfavourable for the multiplication of the moths, and so much progress was made during that year that ten towns appeared to have been entirely cleared of the moth. The committee in charge of the work believed the time had come to strike a decisive blow. The Director and the Entomologist went carefully over the ground and estimated the cost, recommending in their

report to the committee that a large appropriation be granted by the Legislature for immediate use. The Legislature cut down the estimates for the appropriation, and granted only one hundred thousand dollars. Thus the best opportunity in the history of the work was lost. During the past three seasons the meteorological and other conditions seem to have been particularly favourable for the increase of the gypsy moth, and no such favourable opportunity for its complete extermination has offered as was presented in 1892. From that time until the present, although large sums have been annually appropriated, aggregating altogether more than half a million dollars, each appropriation has been far less in amount than the immediate necessities of the work required, and each has been granted so late in the season that it has been impossible to accomplish the desired results. This ineffective legislation has been, no doubt, the result of an organized opposition on the part of those who do not believe in the possibility of extermination. Considerable opposition has come from farmers, people who are benefited, perhaps, more than any other class by the policy of the State in making appropriations for this purpose.

Many of the worst swarms of insects have been entirely exterminated, and the work has been so effectively done in most of the outer towns of the infested region that the moth has been cleared from these towns so far as careful inspection could determine. But during the present year, the appropriation having been delayed nearly six months, the caterpillars in the central towns hatched and became again somewhat generally distributed over the region, thus reinfesting some of the places originally infested and also originating new colonies.

Few moths have ever been observed outside the region found infested in 1891, except in one or two isolated localities, and all the moth colonies found since 1891, outside these thirty towns, had evidently been in existence for several years when discovered. None have been found at a distance from the infested towns. Since work was begun the present year the progress made has been very encouraging. The numbers of the different forms of the moth found this year have so far been much less than those found in 1895. No moths have been found in the extreme north-easterly towns, such as Danvers and Marblehead, and very few have been found in Lynn, a city which formerly had more than twelve hundred infested localities.

Mr. Forbush expressed a desire for information concerning the death of trees from defoliation by insects.

Prof. J. B. Smith inquired whether or not the infested territory had been reduced.

Mr. Forbush replied that the chief reduction had been made on the outside, but that many colonies had also been exterminated in the centre of the region. The greatest progress was made during the first and second years of the State Board work. There had been cases of re-infestation of "exterminated" territory from larvæ brought from the infested centre.

At the request of Prof. Fernald, Mr. Kirkland spoke briefly of the experimental work of the past year. He stated that two main lines of investigation had been followed: experiments with insecticides and the study of natural enemies. In conjunction with the chemist who prepared the compounds, a large series of arsenical preparations had been tested. Experiments with Paris green and correctives to prevent burning gave negative results. Sulph-arsenates did not give results superior to arsenites. Experiments with arsenite of lead versus arsenate of lead had shown the two poisons to be about equal in insecticidal properties. The former is somewhat heavier than the latter, and does not stay in suspension as well. The experiments with barium arsenate had already been described.

Of the few hymenopterous parasites taken, *Pimpla pedalis* and *P. tenuicornis* had been reared in small numbers from *Porthetria dispar*. The first brood of these insects attacks the *Clisiocampa americana*, and the second brood emerges in time to prey somewhat on *P. dispar*. The work on life-histories of the predaceous beetles had been carried out by a man especially detailed for the purpose, Mr. A. F. Burgess, and much valuable information obtained.

Many predaceous Heteroptera of the genera *Euschistus* and *Podisus* had been reared and studied by Mr. Kirkland, and many doubtful points in their life-history cleared up. These insects when emerging from their hibernating quarters attack the larvæ of the tent caterpillar, *Clisiocampa americana*, in great numbers.

The Japanese parasite of the gypsy moth had been received from Rev. H. A. Loomis, Yokohama, but the cocoons of the parasite were infested by a secondary parasite. Only a few of the primary parasites were alive when received, and these died without attacking gypsy moth larvæ ("enfeebled"). This Japanese parasite would be worthy of careful study should the work of exterminating the gypsy moth cease. The

experimental work of the Gypsy Moth Committee has suffered from the effects of the same shortsighted legislative policy that has hindered the progress of field operations. Mr. Kirkland pointed out that often the expenditure of a small sum in experimental research gave valuable results, and regretted that the experiments on the gypsy moth had been made to suffer from lack of funds.

In discussing the above remarks, Prof. A. D. Hopkins highly commended the good work that had been done in destroying the gypsy moth, but expressed the opinion that extermination would not be accomplished, owing to the lack of financial support on the part of the Legislature.

Prof. J. A. Lintner advocated the advisability of extermination, and stated that it was his opinion that if the State would grant sufficient funds, extermination would be accomplished. He thought the time had come when Massachusetts should be aided by the financial support of the National Government. He contrasted the action of the Government concerning the Rocky Mountain locust invasions with its present inaction as regards the gypsy moth. National support would also inspire the Massachusetts people with more confidence.

Dr. James Fletcher spoke in very flattering terms of the success in extermination thus far obtained, and of the value of the special report on the gypsy moth to entomologists in general. This book he considered would be an invaluable work of reference for economic entomologists.

He had been in the infested region twice and knew that the work had been well done, and this in spite of difficulties arising from insufficient means. In answer to a question by Dr. Fletcher, Mr. Forbush made a more explicit statement concerning the progress of the work and the conditions governing the same. He cited the case of the city of Lynn, where over one thousand colonies of the gypsy moth had been exterminated.

Dr. Fletcher suggested that the Association should give formal expression of its opinion regarding the attempt being made by the State of Massachusetts to stamp out this pest.

Prof. J. B. Smith stated that New Jersey devoutly hoped that the insect would be kept within its present domain, and offered resolutions commending the work already accomplished by the State of Massachusetts, and urging the continuance of the same, with liberal financial support.

Prof. F. M. Webster seconded Mr. Smith's resolutions, and the same were carried by a unanimous vote.

NEW SPECIES OF NOMADA AND CHYPHOTES.

BY T. D. A. COCKERELL, MESILLA, N. M.

The two following descriptions were intended to be included in articles discussing at some length the *Nomada*, spp., of New Mexico, and certain Mutillidæ; but poor health having caused these to be indefinitely postponed, the descriptions are presented herewith.

Nomada gutierrezii, n. sp.—♀. Length, 7 mm.; stout, ferruginous with cream-coloured markings. Pubescence practically confined to a slight hoariness around the bases of the antennæ, on pleura, on metathorax (except enclosed portion), on legs, and the hindmost half of the abdomen. Head considerably broader than long, face flat, punctures close on front and vertex, more sparse on face; lower margin of clypeus forming a slightly raised rim; mandibles dark at tips, with an obscure pale yellow spot near base; ocelli on a dark patch, closer together than the diameter of either; pale face-markings confined to a broad cream-coloured stripe on each side, extending from (but not on to) the clypeus to a short distance before the summits of the eyes, broadest at its lowest end. A small light spot behind each eye at the top. Antennæ ferruginous, with the flagellum becoming blackish; first joint of flagellum about as long as second and third together; second and third about equal. Mesothorax and scutellum with very large but not particularly close punctures, scutellum distinctly bilobed; enclosed space of metathorax bare, very minutely lineolately sculptured. Tegulæ shining, sparsely punctured, apricot colour. Hind border of prothorax, tubercles, oval spot on hind part of pleura, scutellum except a dark central shade behind, and postscutellum, cream colour. A small yellow spot also immediately in front of each anterior angle of scutellum. Legs ferruginous, a creamy dot at end of hind tibiæ, and line on first joint of hind tarsi. Claws very deeply cleft. Wings hyaline, with a fuliginous shade commencing along basal nervure, extending through the upper part of the first discoidal cell, all the submarginals and the marginal, darkening at the end of the marginal, and ending in a large suffused apical shade, between which and the third submarginal is a clear space. Nervures piceous, stigma ferruginous. Third submarginal cell narrowing more than half to marginal. Abdomen very finely and closely punctured; first segment with a creamy band, about twice as wide at sides as in middle; second segment with a creamy band, as narrow in middle as that on first, but rapidly widening laterally, where it is at least twice as broad as that on first. Third segment with a cream-coloured spot on

each side; fourth with a band, hidden by the overlapping third segment; fifth with a broad band. Apex with a fringe of dark hairs. Venter ferruginous, immaculate.

Hab.—Mesilla Valley, New Mexico, about a mile south-east of the Agricultural College, on *Gutierrezia sarothrae*, var. *microcephala*. October 5, 1895.

Apparently nearest to *N. zebrata*, Cress., but differs by the immaculate venter, etc. Mr. E. Saunders remarks (in litt.) that in the European *Nomadæ* the first joint of the flagellum is generally extremely short, often scarcely visible. This seems not to be usual with our species.

Chyphotes mirabilis, n. sp.—♀. Length, about 11 mm.; head rounded, about as big as anterior part of thorax; eyes hemispherical or bean-shaped. Antennæ gradually tapering to a very fine point, scape stouter than flagellum, funicle hardly apparent. First joint of flagellum half length of second. Mandibles with a small tooth within. Maxillary palpi 5-jointed; labial palpi apparently 3-jointed. Thorax narrow, deeply constricted in middle, hind portion longest. Intermediate tibiæ with two spurs. Tarsal joints tipped with whorls of spines. Abdomen shaped much as in *Photopsis*, first segment rounded, its suture with the second deeply constricted, its base rapidly attenuate to a narrow petiole. Surface of abdomen with close shallow punctures, becoming subcancellate. Colour dullish chestnut-red, tips of antennæ darkened, tarsal spines black, tibial spurs dull white. The head and the anterior portion of the thorax are densely covered with appressed pale golden pubescence, on dorsum completely hiding the surface. Intermingled with this are a few erect black hairs. Remaining parts of the body visible, some sparse pale pubescence on sides of hind part of thorax, on legs, and sides of abdomen; hind coxæ with a small patch of dense pale pubescence, hind margin of first abdominal segment broadly but irregularly covered with silvery hairs, hind margin of second segment with a pair of silvery hair patches, overlapping third; and the same, less developed, on hind margin of third. In addition to the above, there are everywhere sparse erect black hairs, which are more abundant at the sides of the abdomen towards the tip.

Hab.—Mesilla Valley, N. M. One on campus of the Agricultural College, July, 1896.

I have given generic as well as specific characters in the description, as this remarkable insect may form the type of a new genus, or at least a subgenus.

A. A. A. S.

ENTOMOLOGY IN SECTION "F," BUFFALO MEETING.

The interest in Entomology at the Buffalo meeting of the American Association for the Advancement of Science was fully up to the standard of former years. Two days preceding the date of meeting — Friday and Saturday, August 21st and 22nd — were fully occupied in the reading and discussion of papers by the Association of Economic Entomologists. The entomological papers assigned to Section "F" were arranged to be read the first day of papers (Tuesday), and nearly the whole day was thus occupied. The following entomologists were present at the sessions of the Section: L. O. Howard, C. L. Marlatt, F. M. Webster, J. A. Lintner, Jno. B. Smith, A. D. Hopkins, E. P. VanDuzee, C. W. Hargitt, Jas. G. Needham, Agnes M. Claypole, and D. S. Kellicott.

The papers read are briefly summarized below:—

1. Dr. L. O. Howard, United States Entomologist, read a paper on the entomological results of the exploration of the British West Indies by the British Association for the Advancement of Science, detailing the steps by which this important investigation had been brought about and summarizing the results of the different papers which have been published since the beginning of the investigation. He eulogized the British Committee for its conception of the work and the liberality with which it has been carried on, showed the importance of the results so far achieved, and made a plea for the association of entomologists with scientific expeditions in this country, and for the close collecting of insects, which has apparently been heretofore considered as of less importance than the collection of higher animals and plants.

After discussion by Dr. Theodore Gill, in which he pointed out that the West Indies were not islands in a faunal sense, but parts of South America, etc., simply separated by narrow channels of water, the same author read the second paper.

2. "A Case of Excessive Parasitism."—He described in some detail the facts concerning the rearing of one hundred and twenty-seven specimens of six species and five genera of Chalcididæ from the Lecanium scales on a twig of arbor vitæ received from Ottawa, Can.

3. "On Life Zones in West Virginia."—A. D. Hopkins detailed the work in mapping the life zones in the mountains of West Virginia. The paper was discussed at length by Dr. Smith, Dr. Lintner, and Dr. Howard. It was elicited that very much careful work in the line of the

paper remains to be done before the maps can be more than tentative. Dr. Smith called attention to the fact that the geological formations often mark sharp transitions in the distribution of insects and also in life histories. He cited the fact that on one border of a certain formation in New Jersey the elm-leaf beetle and codling moth are single-brooded and on the other double-brooded.

Dr. Howard called attention to the fact that locality labels by States were unreliable for West Virginia.

4. A fourth paper by F. M. Webster, entitled "Warning Colours, Protective Coloration, and Protective Mimicry," was read and discussed at length.

The paper treated of cases among insects where a species unarmed and in no way capable of protecting itself, was, to a certain extent, protected by its resemblance to armed species, or such as are known to be distasteful. Others, by their actions, mimicked the movements of certain other species, and were thereby mistaken for such as are inedible. The ground was taken that birds, after learning that certain insects were not fit for food, would shun any other insects appearing like these, wherever they might come in contact with them, even though at a different season of the year. There may be cases where one species mimics another, when the enemy has become exterminated and no protection is needed. Caution was enjoined against hasty and immature conclusions, as there is much to be learned in the matter, but facts should not be cast aside as mere coincidences when more information would enable us to push the problem to a point nearer a solution. That insects, especially, gain protection from their coloration and movements is assured, but much caution is necessary before conclusions are reached. The paper was illustrated by specimens.

5. "On the Variations of certain Species of North American Odonata," by D. S. Kellicott, was a brief study of certain of our common species. Attention was drawn to the fact that species were not always separated even by authorities in the group; that when distinct species are separated from their confrères by such very slight differences of structure and coloration it is necessary to carefully record the variations of even our commonest species. The species reported were *Enallagma carunculatum*, Morse, found in collections, until Morse pointed out its distinctness, under the label of *E. civile*, Hagen., and the Gomphines, *G. fraternus*, Say, and *G. externus*, Selys. The first was found to be in

Ohio very constant in size: abdomen, ♂ 27 mm., ♀ 27.3 mm.; hind wing, ♂ 19.9 mm., ♀ 21 mm. The postocular spots were found to vary from long, narrow, wedgy, connected, to short, ovate, disconnected. Other markings usually employed in descriptions were found to vary greatly. The superior appendages of the male were found to be constant in length compared with the tenth segment, and in pattern.

Gomphus fraternus and *G. externus* were studied by B. D. Walsh and the details and comparisons published in the *Proceedings of the Ent. Soc. of Philadelphia*, Volume II. In regard to the former he says there is no slender thorn in the vertical vesicle of the female. These the author found always present, to be long and slender, and to vary in colour between wholly black and wholly yellow. The yellow vitta on the hind femur of the female, claimed by Walsh to be a distinguishing character, was found to be present in about one-half the individuals and wholly wanting in one-fourth. In *externus* the spine of the vertex is present. It is a short, dark cone. The vitta on the posterior femur varies much as in *fraternus*. The conspicuous vitta on the ninth abdominal ring of *externus*, male, varies as follows: In about nine cases in ten it is normal; *i. e.*, extends the entire length of the segment, broad, and orange in colour; one in ten has it faint and narrow. An occasional male of *fraternus* has a similar faint vitta on nine.

In size both species were found to be exceedingly constant and larger than the measurements given by Baron de Selys. *Externus*: Abdomen, ♂ 40.3 mm. (average of ten); ♀ 39.3 mm. (average of three). Hind wing, ♂ 32.5 mm.; ♀ 34 mm. *Fraternus*: Abdomen, ♂ 36.8 mm. (average of ten); ♀ 37.2 mm. (average of ten). Hind wing, ♂ 30.9 mm.; ♀ 31.5 mm.

Other discrepancies were pointed out in Walsh's description of the female of *externus* (*consobrinus*) and a question raised as to the accepted conclusion that *consobrinus*, Walsh, is after all a synonym of *externus*, Selys.

6. A second paper was read by Dr. Kellicott, "On the Occurrence of Dragonflies in Ohio in 1896." The seasons of 1894 and 1895 were those of extreme drought. Ponds and streams went dry for weeks over wide areas. A dearth of Odonata was looked for in 1896. This has not been the case; on the contrary, there has been an extreme abundance. No species heretofore known to abound has been missed, whilst several not before noticed have occurred, widespread and numerous. It would

appear to follow that the nymphs may bury themselves in the mud and remain in the dry capsules for a long time unharmed until rains return. Cases were cited of *Diplax rubicundula* and *D. obtrusa* industriously ovipositing among the grass of a dried-up pond, and of *Lestis triangularis* ovipositing in plants in similar places.

Mention was also made of the capture of more Southern species in the Maumee Valley.

7. A valuable morphological paper was presented by Miss Agnes M. Claypole, of Wellesley, Mass., on "The Appendages of an Insect Embryo." The form used was identified as *Anurida maritima*, Guerin, and was collected under stones on the beach at Woods' Holl, Mass. It belongs to a wingless group of Insecta, the Collembola, and is the first form of the group as yet studied in microscopic sections.

The cleavage of the egg is complete, holoblastic, a character belonging to this group of insects only, all the others having central cleavage. The appearance of the appendages takes place very early, the antennæ being the first of the series; following the antennæ is a pair of very small appendages on the body segment, carrying what is well known to be the third brain segment. Behind these, the mandibles, 1st maxillæ, and 2nd maxillæ appear successively, in turn followed again by the thoracic appendages. All of these organs increase in size excepting the small pair on the third segment, which remain unchanged till the mouth-parts and antennæ have assumed almost distinctive characters. Then these small ones begin to grow as a ridge down each side of the three pairs of mouth-parts and finally form a wide platelike appendage enclosing the mandibles and second maxillæ entirely. In the adult the mouth-parts are known to be enclosed in a tube, or to be "drawn in," as the condition is usually described.

If, as is generally acknowledged, the insect antennæ are considered homologous with the first pair of antennæ of the Crustacea, a point of considerable interest is developed. The appendage of the third brain segment has been found in many insect embryos, but in all cases is a purely embryonic structure; it disappears before hatching. Among terrestrial Crustacea—the wood lice, for example—the second pair of antennæ is reduced to an extremely small size. Hence *Anurida* is an interesting form showing an insect in which the second pair of antennæ of the Crustacea is present, and functional in the adult; the function, however, is completely changed.

D. S. KELLICOTT,
Secretary Section F.

MISS G. E. ORMEROD.

It is with deep regret that we record the death of Miss Georgiana Elizabeth Ormerod, of Torrington House, St. Alban's, England, the elder sister of Miss Eleanor A. Ormerod, whose name as a distinguished entomologist is known throughout the scientific world. After several months of patiently-borne illness, she passed away on the 19th of August last, full of piety and good works, and justly esteemed and loved by all who knew her. She and her sister were each other's constant companion and fellow-worker, and each sought the other's counsel and aid in carrying out any plan of work in which she was engaged. Miss G. E. Ormerod's special studies were botany and conchology, and in the latter department she formed a large and valuable collection of shells, which she presented, a few years ago, to the Natural History Museum at Huddersfield. She was highly gifted as a linguist, and acquired an excellent knowledge of French, Italian, Spanish, and German, and was thus enabled to be of the greatest assistance to her sister in correspondence and the translation of foreign works of science. She is most widely known, however, by her remarkable talents as an artist, which were employed in the illustration of her sister's works, and in the production of a splendid series of diagrams in which are depicted a large number of the most important injurious insects in all their life-stages.

In addition to her scientific and artistic work, she devoted much of her time and means to benevolent objects, and carried out for many years, at her own expense, a system of distributing books of an entertaining and instructive character amongst the working classes.

Women of such a type are rare, and we cannot but deeply deplore the loss of this eminent Christian lady, who died at an advanced age, full of good works, performed in a most unobtrusive manner; richly endowed with intellectual and artistic talents, which she largely used for the benefit of others; always happy and cheerful in her daily domestic life; kind, hospitable, and sympathetic; ready to help all who deserved her aid and to give wise counsels to those who sought them from her.

To her sister—her life long colleague—the loss is beyond what words can express. We can only venture to offer to her our heartfelt sympathy and our earnest wish that she may have grace and strength to endure so heavy a blow.

C. J. S. B.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting was held in London, on the 21st and 22nd of October, when the following were elected officers for the ensuing year :—

President—J. W. Dearness, London.

Vice-President—H. H. Lyman, Montreal.

Secretary—W. E. Saunders, London.

Treasurer—J. A. Balkwill, London.

Directors : Division No. 1—James Fletcher, LL. D., Ottawa.

Division No. 2—Rev. C. J. S. Bethune, D.C.L., Port Hope.

Division No. 3—Arthur Gibson, Toronto.

Division No. 4—A. H. Kilman, Ridgeway.

Division No. 5—C. G. Anderson, London.

Ontario Agricultural College—Prof. J. H. Panton, Guelph.

Librarian and Curator—J. A. Moffat, London.

Auditors—J. H. Bowman and R. W. Rennie, London.

Editor of the Canadian Entomologist—Rev. C. J. S. Bethune, Port Hope.

Editing Committee—Dr. J. Fletcher, Ottawa ; H. H. Lyman, Montreal ; Rev. T. W. Fyles, South Quebec ; James White, Snelgrove.

Delegate to the Royal Society—J. D. Evans, Trenton.

Committee on Field Days—Dr. Wolverton ; Messrs. Hotson, Balkwill, Saunders, Anderson, Rennie, Bowman, Elliott, and Spencer, London.

BOOK NOTICES.

A LIST OF THE BUTTERFLIES OF SUMATRA, with especial reference to the species occurring in the north-east of the Island. By L. de Nicéville and Hofrath Dr. L. Martin. Calcutta. Reprinted from the Journal of the Asiatic Society of Bengal, 1895.

This list of seven hundred and fifty-six species of butterflies taken in a limited portion only of the great Island of Sumatra, gives one some idea of the wealth of the insect fauna in tropical regions. In a very interesting introduction the authors give a brief description of the Island, which is nearly as large as France and is bisected by the equator, and relate the difficulties that have to be surmounted in the formation of a collection of its butterflies, which can only be effected by employing natives, who have first to be taught and trained for the purpose. Dr. Martin lived for thirteen years on the Island and has thus been enabled to add very interesting notes on the distribution, scarcity or rarity, habits, season of occurrence, etc., of a large number of species. One may, therefore, open the list anywhere and find not a mere record of names, but highly interesting details regarding the butterflies. As might naturally be expected, the preparatory stages of the majority of the species are as yet unknown.

A LIST OF THE BUTTERFLIES OF SIKHIM, by Lionel de Nicéville, F. E. S., etc. Calcutta: from the Gazetteer of Sikhim. Printed at the Bengal Secretariat Press.

Probably no part of the great British Empire of India and its tributary States has been so fully explored by the collectors of butterflies as the country of Sikhim, which includes the famous health resort of Darjeeling, about 7,000 feet above the sea, on the slopes of the Eastern Himalayas. Consequently the author is able to record in this list no less than six hundred and thirty-one species, which he considers a near approach to the maximum number that can be discovered. Certainly it is a goodly number, and one hard to be realized by a dweller in these northern and much less luxuriant regions. And what splendid creatures they are, with their gorgeous colouring and infinite variety of shapes and hues. Nearly fifty species of Papilios alone are recorded, and more than one hundred and fifty Lycænidae, the greater number of which belong to genera that are entirely unknown to us here.

CRITICAL REVIEW OF THE SESIIDÆ FOUND IN AMERICA NORTH OF MEXICO, by William Beutenmüller, pp. 111-148, Bull. Am. Mus. Nat. Hist., VIII., 1896.

The writer of the present brief notice of this excellent paper on the *Sesiidæ* desires to call attention to the very careful work of Beutenmüller on the clear-wings and the necessity for this work which has arisen from the uncritical publications of preceding authors. It appears, for instance, that our *S. lustrans*, a species well distinguished by antennal peculiarities, has been five times the subject of new descriptions by the late Mr. Hy. Edwards, whose species are very properly reduced, as appears from Beutenmüller's studies. The name hitherto used for this species itself must, it seems, give way to *bassiformis*, Walk., described from a type in poor condition. Beutenmüller is quite correct in calling attention to the particular necessity in this group for good material from which to describe. The want, perhaps, of such material led Mr. Edwards to describe *S. rutilans* six times over. A large number of sexual determinations by Mr. Edwards are corrected by Mr. Beutenmüller, so it seems hardly possible for anyone to have worked with less judgment. The list of the clear-wings in the New York Check List was drawn up, with the rest of the list, by the writer of the present lines, who at the time merely sent the last proof to the late Mr. Hy. Edwards for his revision. Mr. Edwards added, in explanation, the two foot-notes on page 12 and signed these, and made one or two changes in his names for genera on page 11. The writer is also responsible for the list of the clear-wings, since he originally wrote the same, and not Mr. Edwards. The explanation is here given, as the list has been erroneously alluded to as the work of Mr. Edwards. In the Philadelphia list the New York list is generally copied, but *lustrans* is wrongly given to Mr. Hy. Edwards, and an implication is conveyed in the preface that Mr. Hy. Edwards was the author of the list of the clear-wings, which is here corrected. The writer trusts that Mr. Beutenmüller will continue his studies and that lepidopterists generally will help him in every possible manner. It is a matter of great satisfaction that Mr. Beutenmüller's timely work is also of such good quality. The writer would merely reclaim his *Sesia pictipes*, which is also given to Mr. Hy. Edwards, on p. 134, and draw attention to the excellent description of the habits of this species given by the late Dr. Bailey in the pages of the *American Entomologist*.

A. RADCLIFFE GROTE, A. M.

CORRESPONDENCE.

"DIE SATURNIIDEN."

SIR,—In comment upon my friend Dr. Dyar's kind notice of my classification of the *Saturniides*, I would say that I believe the stinging spines of *Hemileuca* and *Automeris* may have developed along different lines from an initiatory existence in a common ancestor. I place, therefore, the origin of these groups lower down, approximating, in my "tree." *Hemileuca* seems to me to have differentiated from the lower and primitive type (which latter is *Agliid* and has retained more of the *Tineides* characters) by the achieving of the Saturniid character of the forking of IV₁ and IV₂. This character is of the first importance and indicates the original divergence of the primitive group. In my "tree," I show by the relative heights the relative specialization of the subfamilies. With regard to *Aglia*, it does not seem to me to be necessary that the larva should have reacquired, but merely retained, the anal tubercles which have become lost in *Citheronia*. The latter is a degenerate type. In my "tree," I have carried *Citheronia* beyond the base of the *Aglia* stem, to show its independent devolution; but only a little way beyond, because, in a vertical view, *Citheronia* represents the lowest Saturnian form, retaining vein VIII., which both *Aglia* and *Automeris* have lost. I place *Automeris* higher than *Hemileuca*, which Dr. Dyar has not noticed. *Automeris* and *Aglia* are more specialized in other directions, but have retained the primitive location of IV₂. All these points have been considered in my "tree."

A. RADCLIFFE GROTE, A. M.

RARE BUTTERFLIES.

Euptoieta Claudia.—Toronto, 1893 (am not sure of month, but think I took it in July).

Libythea Bachmani.—Caesarea, 12th August, 1896.

Satyrus Alope.—Niagara Falls, Canadian side, 14th July, 1896.

Colias Caesonia.—Toronto, 13th, 20th, and 27th June, 1896. Fairly common.

Papilio Ajax.—Toronto, 27th June, 1896. Saw several specimens, but only took the one. Saw first one on 14th June.

Pieris Oleracea.—Æstiva—Caesarea, 12th August, 1896.

ARTHUR GIBSON, Toronto.

Mailed November 3rd.



AGROTIS SUBGOTHICA, HAWORTH.

The Canadian Entomologist.

VOL. XXVIII. LONDON, DECEMBER, 1896.

No. 12.

THE AGROTIS SUBGOTHICA OF HAWORTH, AGAIN.

BY M. V. SLINGERLAND, CORNELL UNIVERSITY, ITHACA, N. Y.

In the CAN. ENT. for November, 1895 (Vol. XXVII., 301-307), I discussed all the evidence then accessible to me in regard to the identity of this insect. According to Prof. J. B. Smith, our American authority on American Noctuids, I showed "very conclusively that *subgothica*, Haw., is correctly used for our American species" (CAN. ENT., XXVIII., 4). However, Mr. J. W. Tutt, who has written much about British Noctuids, in an opinionated reply (CAN. ENT., XXVIII., 17), tries to prove that Haworth described a variety of *tritici*, a well-known European (not an American) insect. After a careful study of several authentic specimens of *tritici*, representing nearly as many varieties, from Dr. Staudinger, and after considerable correspondence with both English and American lepidopterists who are familiar with *tritici*, I became convinced that the species, in any of its numerous variations, never approaches near enough to what Americans have called *subgothica*, Haw., to be easily mistaken for the latter: their antennæ are quite different structurally. But Mr. Tutt states: "I can match exactly the specimens which Stephens figures, and Humphrey and Westwood copy, with undoubted genuine specimens of *Agrotis tritici*." Naturally, I was anxious to see one of these specimens, and, under the circumstances, I anticipated that a request to examine one of them would be readily granted. My first polite request remaining unanswered, I wrote a second time, but, as yet, Mr. Tutt has not even replied to either request. The above facts, and especially those which follow, I think demand that Mr. Tutt publish a photographic illustration of one of these specimens of *tritici* var. that it may be compared with the figures on my plate in CAN. ENT. for November, 1895, and especially with the two on the plate accompanying this article.

The following extracts from an interesting and valuable letter, written in response to several of my queries, by one of England's most respected lepidopterists, will throw much light on some obscure points and straighten out some of Mr. Tutt's misconceptions: "Stephens's and Wood's figures

seem to me to be made from a specimen, probably from the same specimen, of genuine *subgothica* of American writers. Humphrey's figure possesses the curious character, so conspicuous in *subgothica*, of an oblique pale stripe running from the median nervure immediately below the stigma. This is curious, because no tendency toward such a marking shows itself in the varieties of *tritici*."

"Mr. Raddon, who was mentioned as the person spoken severely of by Doubleday, was a respectable gentleman, an engineer, living at Bideford, on the west coast of Devonshire. He is famous in English lepidopterous history as the discoverer of *Deilephila euphorbiæ* in the larval state in numbers on some extensive sand burrows near Barnstaple. Bideford and Barnstaple are on opposite sides of the estuary of the Taw and Torridge; and from these two far-western ports extensive trade was carried on with America back to the days of the buccaneers and Sir Francis Drake. Consequently, my firm belief is that these and other American insects arrived there among timber or other produce, and naturally enough were picked up by Mr. Raddon as genuine 'Britishers'."

"I have written about Mr. Raddon to perhaps our oldest living collector, Mr. S. Stevens. He replies: 'I suspect that I am the only living entomologist who can give you any information about the late Mr. Raddon. Between 1837 and 1844, I used to meet him occasionally at the meeting of the Entomological Society, when he came up to London and brought a few of the insects that he had bred and captured. He died in the spring of 1848. I happened to be staying at Ashburton, South Devon, in August that year, and on receiving a letter from my brother, went to Bideford to see to packing up the collection, which was sold in October of that year.' Mr. Raddon was believed in then, and probably with justice. Was Raddon a collector as early as 1810? Yes, his first capture of *D. euphorbiæ* was in 1806, his largest haul of it in 1814."

"There is no reason to suspect that Haworth knowingly described as British any species which was not so, but unwittingly he certainly did. It is not possible always to sift out a statement, and there were collectors then who were willing to astonish their friends with insects that they certainly had not captured. I think that this does not apply to the original specimens of *subgothica*."

Thus, contrary to Mr. Tutt's surmises (pp. 17 and 21 of his paper), Mr. Raddon began collecting insects before 1810, when Haworth described *subgothica*, and until after 1829, when Stephens wrote. It is not impossible,

then, that Haworth's material came from the same source as Stephens's. On page 22 of his article, Mr. Tutt tries to show that the specimen of *subgothica*, Haw., of American writers, found by Mr. Barrett in the old Burney collection, was not likely to have been obtained by Mr. Burney in Haworth's time. However, Rev. R. A. Burney, who was born in 1775 and died in 1836 (three years after Haworth's death), was an ardent collector of insects for 30 years. His collection went to his son, Mr. H. Burney, who continued to collect for over 30 years. It was the latter Burney who died in 1893, but the specimen of *subgothica* recently found by Mr. Barrett (Ent. Month. Mag., XXV., 223) originally came, as he distinctly states, from the collection of the elder Burney, who *was* a contemporary with—and could have and did, Mr. Barrett says, correspond with—Haworth. In regard to the Burney collection, one of England's most noted lepidopterists writes me: "To call his collection a 'scientific lie' is worthy of the person who wrote it. The vast majority of his insects were genuine enough. A few of doubtful nativity were in the collection, but he had removed the most glaring species which had been imposed upon him, and, I think, destroyed some of them."

The above facts show that there could have been and that there was at least one (Haworth himself states he had seen his species in three museums or collections)—Burney's—specimen of the *subgothica* of American writers in English collections in Haworth's time; as Mr. Raddon collected before 1810, Stephens's specimen might also have been one of those seen by Haworth. In the light of the above facts, and especially in connection with what is to follow, it would seem that Mr. Tutt's sarcastic remarks in the closing sentence on page 22 and in the first sentence on page 23 (CAN. ENT., XXVIII.), might equally as well be applied to his own arguments in this discussion; but sarcasm is not science nor logic.

I consider myself fortunate in being able to draw most of my information from English sources, for I thus escape Mr. Tutt's allegation that no American entomologist had or has the slightest knowledge of the British Noctuids. As a final argument in support of my claim that Haworth's *subgothica* is an American insect and not a variety of the European *tritici*, I have to offer a British picture, shown in the lower half of the plate. This photograph was taken by Mr. Gepp, in the British Museum, under the direction of Mr. A. G. Butler and Mr. C. O. Waterhouse. It purports to be a likeness (twice natural size) of Haworth's

original type specimen of *subgothica*! Its authenticity is vouched for by Mr. Butler in the following letter to the writer:—

“Mr. Waterhouse suggested to me that as Stephens purchased part of Haworth’s collection, it was possible that the original type might be in Stephens’s collection *now*. I thought it hardly probable, for the very reasons urged by yourself; but *there it is*, or at any rate a specimen labelled in Haworth’s style and in his writing.

“All of Haworth’s types are ticketed in the same way (note the peculiar triangular label and the printing of the name in the picture on the plate). Of course, italic writing is much alike whoever does it, but I should do it differently from Haworth [here Mr. Butler gives his style]. Old Smith, in his labels, differed again [a sample of Smith’s style is here given]. In Haworth’s label the *s* and *b* are the most distinctive features. I have no doubt that the Stephensian specimen is Haworth’s type.

“The type of *subgothica* has a strongly pectinated antenna (see the picture), but examined through a lens this antenna is clearly seen to be glued on to the right eye. It does not belong to the specimen, which is undoubtedly identical with *A. tricola*, Lintner.

“Stephens’s figure cannot have been made from Haworth’s type; indeed, it is stated to have been drawn from a specimen in the possession of Mr. Raddon. Collectors were easily gulled in the days of Stephens, and doubtless anybody who cared to pay for Haworth’s species to complete his ‘*British*’ collection could get something quite near enough to represent it. Stephens’s figure is evidently taken from a specimen of the same species as *Feltia ducens*, Walk. (All recognize this as equal to the *subgothica* of American writers.)

“We have a whole drawerful of Haworth’s types, and in every instance the labels are cut in the same peculiar way (see figure); also in every label on which the letters *s* and *b* exist they are formed precisely in the same manner. There is, therefore, not the least doubt that the specimen in Stephens’s collection is the type and that *A. tricola*, Lint., must be called *subgothica*, Haw.”

As Dr. Lintner, the author of *tricola*, has kindly given me a type specimen of his species, I am able to present, in the upper half of the plate, a picture of it, twice natural size, for comparison with the picture of Haworth’s type of *subgothica*. Both Dr. Lintner and Prof. Smith agree that the photographs represent insects of the same species. I think a careful study of Guenee’s descriptions, and especially of his figure of

jaculifera, will show, what most lepidopterists admit, that he had three species before him, from which he deduced a type description and two varietal descriptions.

Thus, to summarize, I believe that the evidence given in and brought out by my former paper, with the new facts brought out in this communication, demonstrates beyond any reasonable doubt the following final synonymy for these three much-discussed species :—

Feltia subgothica, Haw.

triosa, Lint.

jaculifera, var. A, Gn.

Feltia jaculifera, Gn.

subgothica, of Stephens, Wood, Humphrey, and all American writers.

ducens, Walk.

herilis, Grt.

jaculifera, var. B, Gn.

FURTHER ADDITIONS TO MY 1894 LIST OF WINNIPEG BUTTERFLIES, WITH NOTES FOR SEASON OF 1896.

BY A. W. HANHAM.

Neonympha eurytris, Fab.—Two. June 23rd and 26th. Both captured in Elm Park, near the City. These specimens differ somewhat from some I have taken near Quebec City. They are also larger.

Carterocephalus mandan, Edw.—Two. June 18th and 20th. The first in Elm Park.

Pamphila hobomok, Harr.

var. *pocohontas*, Scud. Several in Elm Park, June 18th to 23rd.

The spring was a wet one and the early summer not much better, notwithstanding which this season has been a richer one for diurnals than last. Several visits were made in June and early in July to the locality where the *Phyciodes*, sp., was found in 1894, but nothing but *tharos* was seen.

Pyrameis atalanta, Linn.—This butterfly was unusually abundant here early in the season.

Limenitis arthemis, Dru.—Quite plentiful.

Debis portlandia, Fabr.—This beautiful insect was very abundant throughout the district, and especially so in Elm Park from June 26th to July 3rd (in perfection), and I even took a fine specimen in my back kitchen.

Satyrus nephele, Kirby.—The form *Boöpis* occurs here.

Colias interior, Scud.—A fresh specimen taken near Bird's Hill on July 8th and a second seen.

Colias eurytheme, Bdv.—Very abundant this season from beginning of August until middle of September.

Papilio asterias, Fabr.—A worn ♀ near Bird's Hill on June 29th. No *P. turnus* noticed in the district since 1894.

Pamphila metacomet, Harr.—One. Bird's Hill, July 7th.

Amblyscirtes samoset, Scud.—June 18th. Abundant in Elm Park. Examples not very fresh.

Eudamus tityrus, Fabr.—One seen June 29th near Bird's Hill. I find this a very difficult thing to net.

On July 9th I went to Brandon, Man., for a few weeks and enjoyed some good collecting, but did not get out often for butterflies.

On July 26th and August 2nd, *Argynnis Cybele*, *Cipris*, *Lais* and *Bellona* were seen in abundance. *Colias eurytheme*, var. *eriphyle* and *Keewaydin*, were very common everywhere during my stay, and on August 2nd I captured a fine ♀ (albino).

Euptoieta claudia, Cram.—One. August 2nd. In fine condition.

Thecla titus, Fabr.—Plentiful in one locality on the prairie August 2nd. No bush near at hand.

Lycena melissa, Edw.—Occasional. July 13th to August 2nd (♂s).

Pieris protodice, Bd.-Lec.—Several taken at Brandon are in the collection of Mr. H. W. O. Boger.

Papilio asterias, Fabr.—One. August 2nd.

Thymelicus garita, Reak.—Common. Worn specimens on wing as late as August 2nd.

Pamphila manitoba, var. *assiniboia*, Lyman.—August 3rd. One (fresh), at rest on a yellow flower in the evening (♂).

A REPLY TO PROF. SMITH.

BY A. RADCLIFFE GROTE, A. M., HILDESHEIM, GERMANY.

With regard to *Mamestra comis*, the whole question as to the setting of the type has been introduced by Prof. Smith, and I submit that this has nothing to do with the matter. I have merely shown that Prof. Smith's statement that the type of *comis* was "typical *olivacea*, but so set as to make it appear differently marked," etc., is inaccurate and impossible, as my description refers to colour and marking, and these cannot be produced by any freak of setting. As I failed to notice any peculiarity of setting in my type, it is probably not very obvious, and as now described by Dr. Smith, must be very slight. I call further attention to the fact that in colour and marking the description of *circumcincta* agrees well with mine of *comis*. I believe, therefore, it possible that *circumcincta* is *comis*. I do not assert it—I have not seen the type of *comis* since the seventies—but I think it possible, nay, probable. Mr. Beutenmüller writes me that the type of *comis* differs more from "typical *olivacea*" than the type of *circumcincta* does. I want these types examined by some competent person who can settle the matter as to whether *comis* is a variety of *olivacea* or not, and what the standing of *circumcincta* really is as compared with either. That *comis* is not "typical *olivacea*" seems now virtually admitted by Dr. Smith, and this is in reality all my contention, and that no amount of abnormal setting can produce differences in colour and marking. This closes my case as to *Mamestra comis*.

Now, as to the type of *Agronoma*, which is *crassa*. If *crassa* agrees with the type of *Porosagrotis* I am glad to hear it, and we shall get a little more light into the matter. The reason I wrote that the front was roughened and tuberculate was that I felt it with a pin's point. My microscope I left behind in America, and there is none in the museum here. I could not distinguish, with the pin, between tuberculate and roughened. *Crassa* does not belong to *Carneades*, because the antennæ are pectinate, and in my opinion the structure of the antennæ offers points of generic value. I have therefore not been able to compare *Feltia* and *Agronoma* as closely as I should have liked; first, because I had no species of the former; secondly, no microscope. But the work of bringing the groups of North American *Agrotis* into correspondence with the European progresses, nevertheless, as we see. That *Feltia* should not be represented in Europe seems not likely, since Haworth's name *subgothica* is held by Mr. Tutt to represent a variety of *tritici*, by Dr. Fitch to be *jaculifera*. In a little

while I hope to get it all straightened out, and I am glad that my original proposal to separate first the species of *Agrotis* with unarmed tibiae has been adopted in his revision by Dr. Smith. I may say, in conclusion, that it is the property of all changes in the synonymy, whether proposed by me or by Prof. Smith, that they should be verified and that they are subject to examination. I have been showing reasons why some of Prof. Smith's changes are not to be followed.

A MEXICAN ALEURODICUS.

BY T. D. A. COCKERELL, MESILLA, N. M.

Aleurodicus Dugesii, n. sp.—Length, $1\frac{2}{3}$ mm.; length of anterior wing, $2\frac{1}{4}$ mm.; its greatest breadth nearly $1\frac{1}{2}$ mm. Pale grayish-ochreous, covered with white meal, abdomen beneath shining silvery. Wings white; upper wings iridescent, with markings similar to those of *A. ornatus*, but very pale gray and quite different in detail. There are four gray bands crossing the wings, of which only the third and fourth are joined by a longitudinal band. The first (basal) band bends abruptly inwards after crossing the main nervure, which branches so near the base of the wing that there are practically two nervures, the first gray band failing in the angle between them, but strong again beyond the second. Second gray band broad as far as the first nervure, just beyond it interrupted broadly, but continued as a large, nearly circular, gray patch, the greater part of which is above the second nervure, and passing thence as an oblique narrow band to the margin. Third band resembling the second as far as the first nervure, which it meets at its fork; after that failing, but reappearing strongly a little way down the lowest branch of the nervure and thence passing downwards, becoming very faint. Fourth band broad, passing across the end of the fork, bent inwards, joining the continuation of the third band after the break, itself forking at its lower end. The curve of the fourth band leaves a white apical area in which there is a gray spot. There is also a gray spot at the tip of the second nervure.

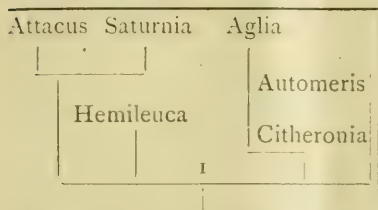
The pupæ occur on the under sides of the leaves and are of the usual type—oval, flat, pale ochreous, with white mealy powder.

Habitat.—Guanajuato, Mexico, on *Hibiscus rosa-sinensis*. Sent by Dr. Alfred Dugès in great quantity. Dr. Dugès writes that it is also found on the large-leaved *Begonia* and other plants, and it does not appear to do them a great deal of harm. It is the first *Aleurodicus* described from Mexico, and is most nearly allied to the Jamaican *A. ornatus*, Ckll. The genus now includes five species, all neotropical except the U. S. *A. asarumis* (Shimer, 1867).

NOTES ON THE PHYLOGENY OF THE SATURNIANS.

BY HARRISON G. DYAR, PH. D., NEW YORK.

Mr. Grote's remark (CAN. ENT., XXVIII., p. 294) that the stinging spines of *Hemileuca* and *Automeris* may have been separately evolved is not in accordance with my views, and I wish to compare his genealogical tree of the Saturnians with the larval characters more at length than was possible in the review of his paper, "Die Saturniiden." I reproduce first his tree: At 1 there is a dichotomous division, the genera on the right having vein IV_2 in the middle of the cell or but slightly moved (generalized);

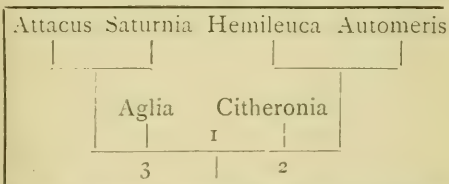


those on the left with vein IV_2 considerably moved toward IV_1 . It is not proved that this movement of IV_2 took place only once in the Saturnians, but it is so assumed, and the construction of the tree depends upon the assumption.

Next I present a tree founded on larval characters, using the same generic types. At 1 is a dichotomous division, the larvae on the right retaining the unpaired tubercle on joint 13 and losing those on the anal plate: on the left losing the unpaired tubercle and retaining the pair on the anal plate.

At 2 is another division, the two genera above acquiring stinging spines, while *Citheronia* remains without them.

At 3 the stem of *Attacus-Saturnia* acquires many haired, reduced tubercles, while *Aglaia* retains the single haired primitive condition and degenerates.



At 3 the stem of *Attacus-Saturnia* acquires many haired, reduced tubercles, while *Aglaia* retains the single haired primitive condition and degenerates.

A comparison shows that these two trees are contradictory, the position assigned to *Aglaia* and *Hemileuca* being almost exactly transposed. Yet, if rightly interpreted, there should be no contradiction between larval and imaginal characters.

If Mr. Grote's tree is correct, *Aglaia* must have reacquired tubercles on the anal plate, because it is derived from the stem of *Citheronia* after *Automeris* was thrown off, and neither of these genera possess these tubercles. Likewise, *Hemileuca* has independently lost these tubercles, unless we suppose that originally they were not present, but were acquired separately by *Attacus-Saturnia* and *Aglaia*. This can not be, however, as

the tubercles are primary, not recently developed structures. Automeris and Hemileuca must have separately acquired stinging spines and not from "an initiatory existence in a common ancestor," as Mr. Grote puts it, because there is no such condition in Aglia or Citheronia, which are placed between them, nor any evidence that these genera are derived from wart-bearing ancestors, a condition necessary for the multiple spine formation. I regard these conditions as very improbable.

If my larval tree is correct, Aglia has remained more nearly in the primitive condition in regard to vein IV_2 in that this vein is only slightly moved toward IV_1 . Yet, it is somewhat moved, which weakens Mr. Grote's point (see the fig. Die Sat., p. 19, fig. 8). Hemileuca has followed out the same process separately; derived from a common stem with Automeris, vein IV_2 has moved close to IV_1 separately from the Attacus branch. Hemileuca is separately specialized in this respect.

Some collateral evidence may help to a conclusion. If these moths be separated on the position of the wings in rest, the wings folded over the back in the shape of a roof or with the upper faces together (as in butterflies) a tree results like the larval one. In the hind wings there are two anal veins in Hemileuca and Citheronia, the rest have one. A tree constructed on these characters (which I believe to be as good as the one selected by Mr. Grote) would be different from either. To reconcile it with my tree, it must be supposed that the left-hand branch had lost one anal vein, while Automeris on the right branch also lost it, but separately. To reconcile it with Mr. Grote's tree, three separate losses of anal vein must be supposed, viz., in Automeris, Aglia, and Attacus-Saturnia. My view is here the simpler.

As to the pectinations of the antennæ in the male, those of Hemileuca only have simple branches; in the female only Attacus-Saturnia have them double. Mr. Grote may suppose that the original ancestor had single pectinations in both sexes, retained in Hemileuca; the right branch acquired double pectinations in the male, while Attacus-Saturnia separately acquired them in both sexes, which seems improbable.

In my larval tree the ancestor must have already possessed double pectinations in the male, which became transferred to the female also in Attacus-Saturnia, but were lost by degeneration in the male of Hemileuca. It is true that this supposition can also be applied to Mr. Grote's tree, so that we are not greatly benefited by the consideration. Other characters will have to be compared; but this I will leave to Mr. Grote, with the

hope that he will examine the matter thoroughly. I believe he will find that the true natural classification is not far from that which I have indicated on larval characters.

Finally, this is perhaps as good a place as any in which to protest against Dr. Skinner's remarks in a recent number of the *Journ. N. Y. Ent. Soc.* Dr. Skinner says: "I may say right here that I believe the imago the culmination of nature's efforts, and that while studies of transformations are most valuable, they will not solve the problem of specific difference or identity." This is not the view of a careful student of the subject, but reads like an excuse for neglecting studies of the early stages. As if the *larva* were not often the "culmination of nature's effort," as in *Apatela* or the *Limacodidae*, or as if the forces determining the struggle for existence must always impinge most strongly on the same stage in all species.

DESCRIPTION OF TWO REMARKABLE ABERRATIONS OF *COLIAS PHILODICE*.

BY DWIGHT BRAINERD, MONTREAL.

We were fortunate in taking a very peculiar pair of *Colias philodice* this summer. They were captured at Edgartown, Mass., in a little salt marsh, August 10th and 14th respectively, and, though hatched during the hot wave, we believe are blood relations — part of a sport brood.

Many specimens were examined at the time, but no other departures from the type found.

Number one is a male very similar to the melanic variety figured by Mr. W. H. Edwards on Plate III. of *Colias* in *Butt. N. A.*, second series. The colouring on trunk and appendages is normal, except that pile on dorsum is mouse-gray, the collar a more decided brick-red than usual, and the yellows, where present, match the deep chrome on wings.

When caught, the whole upper surface (with exception of a dusting of yellow on costal margin of the primaries and a pallid green-white strip on the secondaries from costal margin to and following the radius for three-quarters of its length, gradually becoming obsolete) was a deep bottle-green. On drying, the marginal bands, both wings, appeared as a slight, but uniform, reddish-purple stain, the indentations regularly lunulate, and the nervules came prominently out in dull black lines.

The spot on discal vein of fore wings is present and distinct, but a dark blotch replaces the usual orange patch on secondaries. The rosy marginal line is as in type.

Our plunder this season was all attacked by pests, necessitating a severe cyaniding. Much of the brightness in this butterfly was lost, the colour now resembling the brown leaf-green of oak trees late in August.

Scales on the under side are very heavy, there being no suggestion of a band; the extra mesial spots on primaries are almost wanting, and the general ground colour is a deep chrome. A thick daub of this paint from a good box duplicates it exactly.

On the basal half of the disk in secondaries there is a suggestion of green, and extended from that portion of the primaries covered by the lower wings when at rest, which is of the pallid hue mentioned above, nearly covering the outer half of discal cell, thence interspacing the media and cubitus to the mesial spots, from which it bends sharply to the outer angle, reaching the margin at lower branch of cubitus, there is an overwash of black. This is deepest at its inner border and curiously shaded as it blends with the chrome. The whole lower surfaces, with their bright tips and bold opaque colours, are very handsome.

Number two is a female, pallid above, like a white female, except that the black margin reaches from the discal vein, on the costal side follows the radius, joining margin at its first branch and posteriorly defines the media as far as the border. The outer portion of disk and the costal margin on primaries are more or less splashed with dark scales, while on secondaries the marginal band is only indicated by a dusting on edges of the veins.

Underneath the spots are much exaggerated. On the primaries they appear as large triangular black stains, with apices reaching further and further towards the base until between radius and media they touch the discal spot. On the lower wings this stain is ferruginous, shading to green, and practically covers the disk. The unusual size of these spots outlines a white marginal band, the distinctive feature of the specimen in question.

THE ACADEMY OF SCIENCE, ST. LOUIS, MO.

At the meeting of November 2, Mr. Colton Russell spoke of "What an Entomologist Can Find of Interest about St. Louis," illustrating his remarks by numerous pinned specimens of insects, giving particular attention to the butterflies, and speaking at some length of the phenomena of periodicity, migration, polymorphism, etc., as illustrated by these insects, his paper embodying the result of a large amount of field work performed during the last ten years. Resolutions opposing the passage of the Antivivisection Bill now before the United States Senate were adopted. Three persons were elected to active membership.

WM. TRELEASE, Recording Secretary.

NOTES ON THE LIFE-HISTORY OF CERURA
OCCIDENTALIS.

BY HARRISON G. DYAR.

These notes are to complete the partial account of the life-history given in Dr. Packard's monograph.

Egg.—As usual, hemispherical with a flat base, dark black-brown, not shining; diameter 1.1 mm., height .7 mm. Reticulations neat, distinct, rounded hexagonal, smooth, not elevated, the enclosed spaces densely coarsely granular, serving to make the smooth reticulations conspicuous. Laid singly on a willow leaf.

Stage I.—Head bilobed, rather square; red-brown, the ocelli darker; width .5 mm. Dorsum of joints 3 to 12 continuously broadly greenish-yellow, the rest of the body purplish-brown; tails darker, blackish toward the base, with two sordid white rings. Cervical horns and tails spiny. Setae normal, i. to v. and leg-plate present on the abdomen, i. a and b, ii. a and b, iv. and vi. on thorax, vi. double, ii. b not very evident. At the end of the stage the yellow band is slightly constricted at joints 6-7 and 11, horns, cervical shield, anal plate and tails darker than the now vinous body. Head light red; abdominal feet whitish, thoracic blackish; no marks.

Dr. Packard's descriptions of stages II. and III. are comparative only, so I give my notes in full.

Stage II.—Width of head .9 mm. Medial suture deep; all red-brown, uniform, smooth, the clypeal tubercles marked by yellowish dots. Dorsum to spiracles vinous brown except a yellow patch on joints 3-5 and 7 post.-10 ant., the now dark parts of the former yellow band smoky olivaceous; subventral region and legs pale yellowish; two yellow rings on the tails. Tubercles distinct, setae dark. Cervical horns slightly spinose; length of tails 2.8 mm. During the stage the larva suffers an entire change in markings, resulting as follows: Green, an incised dorsal brown band triangular from the horns to a slight fold on the anterior part of joint 3, elliptical on joints 4 to 11, widening to the anal plate, with a very slight retraction at the incisure of joints 11-12. A yellow patch on joints 7 post.-10 ant.

Stage III.—Width of head 1.5 mm. At first much the same as at the end of stage ii. Later head reddish-brown with many pale yellow dots over the lobes; pale behind the brown ocelli. Body bluish-green, dotted with white and yellow and shaded with white in the region of the

feet; dorsal band light brown, scarcely yellowish in the centre of the large patch, slightly frosted with purplish, darker on the edge and with a narrow yellow border. The band is retracted at joint 4 to the slight single dorsal fold on joint 3 posteriorly, reaches the spiracle on joint 8, not conspicuously incised on the folds, retracted at joint 11 posteriorly, then nearly straight to the anal plate. Tails with two greenish-yellow rings; horns spiny, setæ stiff.

Stage IV.—This has not been previously described. The larva which I bred to fourth stage had the proper width of head (2.5 mm.), but it exhibited smooth cervical horns and the other characters of the final stage, thus maturing with only four stages. The coloration was as described for the full-grown larva. The structures on joint 3 which Professor French calls "tubercles" consist of a fold of skin divided by a dorsal depression into two rounded humps, not bearing any setæ.

Stage V.—Other larvæ found when full-grown had a width of head of 3.1 mm., thus indicating that five stages also occur. Dr. Packard quotes Prof. French's description of this stage, which has been already published in CAN. ENT., XIII., 144.

BOOK NOTICES.

ECONOMIC ENTOMOLOGY for the Farmer and Fruit-Grower, and for use as a Text Book in Agricultural Schools and Colleges; by John B. Smith, Sc. D. Philadelphia: J. B. Lippincott Co., 1896. (Price, \$2.50.)

It is rather remarkable, when the self-evident importance of the science of economic entomology is considered, that until Professor Smith issued his excellent manual, which has just appeared under the above title, there was no one American book which a farmer could consult to find the names and proper remedies for the common crop pests which would come regularly before him in a year's working of his land. The author, in his long experience, first as a member of the staff of the United States Entomologist at Washington, and subsequently as State Entomologist of New Jersey, has had great opportunities of becoming thoroughly informed on his subject. That he has made the best use of these opportunities is evidenced by the excellent book which he has now produced. The best way to test anything is to use it. Thus, if anyone wishes for information upon anything within the limits of economic entomology, the subject of

Prof. Smith's book, as, for instance, some one of the regularly occurring insect enemies of crops, e. g., cutworms, white grubs, canker worms, the Colorado potato beetle, plum curculio, or tussock moth, etc., etc., let him turn it up in the index of this work and he will be referred to a clear and concise account of the insect and its habits, together with recommendations as to the best remedies. The identification of the different species is made easy by a profusion of remarkably good illustrations. The whole book, including the index, consists of 481 pages, while the number of illustrations is no less than 483, all of which are unexceptionable, if a mental reservation may be allowed as to the three plates of bumble bees and bee flies, Nos. 398, 464, and 473, taken evidently from photographs. It seems a pity that these plates should have been included in this work on economic entomology. They were made from very badly mounted specimens, and have no special reference to the text. The arrangement of the book, for ease of reference, is well planned and well carried out, the objects the author had in view, as explained in the introduction, being adhered to in a most satisfactory and complete manner. Part I. consists of eight short chapters on the Structure and Classification of Insects. Part II., the Insect World, which forms the bulk of the book, is a systematic treatment of the various common injurious insects in their natural orders. This portion is particularly well-balanced, enough space being devoted to each species treated of to satisfy the inquirer, without, as is sometimes the case, giving undue importance to some at the expense of others. Part III. treats of Insecticides, Preventive Remedies, and Machinery. This work cannot fail to prove of great value to the farmer and fruit-grower, as well as to the amateur gardener and student of insect life, who will find in it an authoritative book of reference of small size but comprehensive and easy to consult.

J. F.

MISSOURI BOTANICAL GARDEN — SEVENTH ANNUAL REPORT, 1896.

Very few reports are more eagerly looked for every year by those who are lucky enough to secure copies than Prof. Trelease's report on the Missouri Botanical Garden and the Henry Shaw School of Botany at St. Louis, Mo. This report contains not only the Director's annual statement on the condition of the Garden and its finances, but also valuable monographs on different genera of plants. In the present volume we find the following: (1) *The Juglandaceae of the United States*,

by Prof. Trelease ; (2) *A Study of the Agaves of the United States*, by A. Isabel Mulford ; and (3) *The Ligulate Wolffias of the United States*, by C. H. Thompson. A feature of all these annual reports is the magnificent illustrations.

In addition to the above there is the report of a speech delivered at the sixth annual banquet, by President Henry Wade Rogers, of the Northwestern University, on "The Value of a Study of Botany," and a catalogue of the Sturtevant Pre-Linnean Library, the greater part of which was presented to the Botanical Garden by Dr. E. Lewis Sturtevant in 1892.

One very notable omission from the present volume, which we much regret, is the printing of the annual "flower sermon." Last year it was delivered by the Rt. Rev. W. C. Doane, Bishop of Albany.

The first annual event provided for in his will by Henry Shaw, the good man who founded this garden for the enlightenment and happiness of his fellow-men, was "The preaching of a sermon on the wisdom and goodness of God as shown in the growth of flowers, fruits, and other productions of the vegetable kingdom." A lovely poem in prose, for the perusal of which by his friends the writer's copy of the 1893 report is in constant use, is a sermon preached by the Rev. Cameron Mann from the text, "Consider the lilies of the field." This sermon, from a literary standpoint, is charming, and certainly helps to carry out the wise wish of the benevolent founder to inculcate in all a thankful spirit for the many lovely things in the vegetable kingdom which we find strewn with no niggard hand along our walk through life, making our own journey more beautiful and, it is hoped, our friends happier from contact with us.

J. F.

THE CRAMBIDÆ OF NORTH AMERICA ; by C. H. Fernald, A. M., Ph. D., Mass. Agr. College. Jan., 1896. Pp. 81, with six plates.

This latest work is characterized by the painstaking study which Prof. Fernald has taught us to expect in his publications. The statements are well considered ; the very words carefully chosen, so that there are few writers whom we may so entirely and unhesitatingly trust. Conscious as I am of my own shortcomings, that attention has been called to the "extreme desirability of verifying my statements when they involve a change in nomenclature or in synonymy," it is like an atonement for my thirty-five years of labour, without any merit of my own, that I reached so unimpeachable an observer as Prof. Fernald a friendly hand

at the beginning of his career among the little moths. And it is grateful to me, but quite out of the usual course, that Prof. Fernald should have remembered the circumstance. I thank him heartily. As I sat down to write this notice and was seeking for the proper words, a letter was brought in from a well-known and able German writer on the "*Tineides*," thanking me for sending him a copy of "Prof. Fernald's full and satisfactory work on the American Crambidae." It is certainly exactly this, and I need not seek further for adjectives. The appearance of being written quite easily, which Prof. Fernald's work bears, is deceptive. It has been all thought out and written over.

My own studies in the Crambids may give a little weight to a word of general praise and entitle me to offer some comments. The synoptic table and exact definitions will enable the student to identify his material even without the aid of the finely drawn and delicately coloured plates (the figure of *edonis* is perhaps too delicately coloured—I miss the "salmon pink"). But here and there we might easily have had, in addition, more comparative details, to enable one to seize readily important characters and bring the inter-relationships to light. The sequence of the descriptions of the species of *Crambus* is not that of the synoptic table, and it is not clear upon what principle it is laid down. In the absence of structural characters, we have the markings upon which to group the species. First there are the white species (*perlellus*, *girardellus*, etc.), reminding us of *Argyria*. Then the leather-brown species, with a white median stripe cut into blocks, *myellus*, *luctuellus*, *dissectus*. Then what may be considered the typical Crambids, species with gilded and fuscous primaries, with longitudinal subcostal satiny-white striping, *satrapellus*, *leachellus*, *carpenterellus*, *laqueatellus*, etc., etc.: again, with the stripes wanting, *vulgivagellus*, *behrensellus*, etc. These seem to pass, through forms like *attenuatus*, into the plain, gray, or fulvous species, with double, dark and bent transverse lines, such as *laciniellus*, *caliginosellus*, *luteolus*, *anceps*, *undatus*, etc. Then we have the blackish and white species like *labradoriensis* and *oregonicus*, while a number of peculiarly marked forms lead us, through *dimidiatellus*, to the species of *Thaumatopsis*. But this rough sketch of a possible arrangement is entirely suggestive. I may conclude with a few words upon three species. On Plate III., fig. 15, Prof. Fernald gives us a representation of *Crambus inornatellus*. But no mention is made of this pale yellowish form on page 43, where it is referred to merely in the synonymy of *perlellus*. It is nearly twenty

years since I went over the literature, but I believe Clemens describes *luteolellus* without the lines. If so, then *duplicatus* might be kept for the form with lines, of which *ule*, according to Prof. Fernald's figure, would be a sub-variety. It was with feelings of perplexity and annoyance that I found, on page 87 of the Philadelphia List, my *Crambus dimidiatellus* referred as a synonym of *T. pexellus*. The beautiful species is now rehabilitated, while I miss, what Prof. Fernald probably thinks is unnecessary, a word upon the circumstance. This is already the fifth name which has been restored to me, and for those who profess to consider such matters sentimental or unscientific, I should say that to me they are very important, and the distress inflicted by a careless or prejudiced reference is real. Schrank, in 1802, uses *Tinea* in the sense of *Crambus*; I miss an allusion to this in the "History," p. 4. Prof. Fernald has given us since 1884, in addition to catalogues and descriptive papers, four pamphlets on the Insects and Grasses, chiefly of Maine and the Eastern States. The fifth is this on the Crambids. I value all of them very highly. They are bound together and, as I turn over the leaves here in my study, separated by such miles of land and water from the one reality of my existence, I call to mind scenes and faces I may never behold again.

A. RADCLIFFE GROTE.

Roemer Museum, Hildesheim, Germany.

CLASSIFICATION OF THE GEOMETRINA OF NORTH AMERICA, with descriptions of new genera and species; by Rev. Geo. D. Hulst. Trans. American Entomological Soc., Vol. XXIII., pages 245 to 386, plates x. and xi. (1869).

The bulk of this paper consists of descriptions of 82 new genera and 143 new species, most of them from the West. That such an assemblage of new forms can be described in a single paper shows the imperfect state of our knowledge of the family.

The most valuable part of Dr. Hulst's work consists in the tabular synopsis of subfamilies and genera. The characters used seem contrasting and reasonably constant, so that these tables fill a long-felt want. In fact, the article forms the skeleton of a complete monograph, lacking only synoptic tables of species with descriptions of the old ones, bibliography and larval descriptions.

Dr. Hulst calls the group Geometrina, but in the opinion of the reviewer this term is not warranted. We may accept Dr. Hulst's two

families, Geometridæ and Ennomidæ, as consecutive groups of the Bombyces, discarding the superfamily term. However, as used by Dr. Hulst, this term may be only a convenient heading for the article.

The author is in some difficulty to separate the "Geometrina" from the other groups of Lepidoptera, and has to fall back on larval characters. He says: "The larva has one or more pairs of the anterior abdominal legs wanting, and they are thus distinguished from the Bombycina in the widest reach of that term." Yet this is not correct, since *Brephos*, included in the "Geometrina," has all the abdominal feet present, while *Nola*, excluded, entirely lacks the anterior pair.

In the classification Meyrick is followed, as Dr. Hulst considers his "in many respects by far the best yet proposed." Hübner's *Verzeichniss* receives recognition, but not the *Tentamen*. However, the *Tentamen* names are included in parentheses, so that any one differing in his opinion of the value of these names may easily apply them.

On the whole, Dr. Hulst's paper indicates a distinct advance in our knowledge of the Geometridæ.

HARRISON G. DYAR.

INSECT LIFE.—A short account of the classification and habits of insects; by F. V. Theobald, M. A., F. E. S. London: Methuen & Co. Pp. 235. (2s. 6d.)

Under the title of the "University Extension Series," the publishers are issuing a number of books on historical, literary, and scientific subjects, which are intended to be both popular and scholarly. We have not seen any of the other works of the series, and cannot, therefore, comment upon them, but the book before us seems hardly to come up to the expectations one would naturally form of a manual intended for use in preparation for "University Extension" lectures. The descriptive portion is meagre, and will afford a student a very vague idea of the insects belonging to the different orders. It is satisfactory, however, to find in an English publication some attention paid to economic entomology and the application of the insecticides which are in common use here. The book is neatly printed (though we have noticed several misprints in the spelling of names) and is illustrated with over fifty wood cuts.

C. J. S. B.

MR. WALTER W. FROGGATT has been appointed Entomologist to the Department of Agriculture, Sydney, New South Wales, Australia, in place of the late Mr. A. S. Olliff, F. E. S.

BRITISH BUTTERFLIES: by J. W. Tutt, F. E. S. London: George Gill & Sons, 1896. Pp. 469. (Price, 5s.)

It is only a few months since we spoke in terms of commendation of Mr. Tutt's Manual of the British Moths, and now we have before us an even better work on the butterflies by the same industrious author. About one-fourth of the book is taken up with the general subject, presenting a series of chapters on the four life-stages of butterflies, their variation and its causes, hibernation and æstivation, classification, collecting, and arranging and preserving specimens, and the inflation of larvæ. These are written in the author's pleasant, easy style, with which his previous works have made us familiar, and convey much information of interest to butterfly-hunters anywhere. We are glad to observe that he insists very strongly upon the importance of labelling specimens with the place and date of capture; though the English mode of using short pins and setting the specimens low down makes this a matter of difficulty.

The descriptive portion of the work is excellent and much more complete than that of any manual of British butterflies that we have met with. In the case of each species there are given the English and scientific names, reference to the plate where it is figured, synonymy and bibliography, a concise description of the imago, a paragraph on "variation" in which are mentioned any known aberrations, forms or varieties, as well as sexual distinctions, descriptions of the egg, larva, pupa, notes on the time of appearance, habitat, and geographical distribution. Thus it will be seen that proper regard is paid to the whole life-history of the insect, and that the author does not confine his attention to the imago alone. The plates (uncoloured) on which each species is depicted are admirable, and should enable any collector to identify his specimens without difficulty; there are also a considerable number of wood cuts throughout the text.

In the arrangement of species the author begins with the "lowest"—the Skippers, Hesperidæ—and proceeds upwards to the Satyridæ, among which he strangely places "the Purple Emperor," *Apatura iris*. His classification, a thorny subject which we do not propose to discuss here, may thus be considered fully "up to date."

To our readers in the British Isles, and to those who have collections of British butterflies, we heartily commend this excellent Manual. We only hope that it may not be very long before we have some handbook equally good dealing with the butterflies of Canada. C. J. S. B.

Mailed December 10th, 1896.

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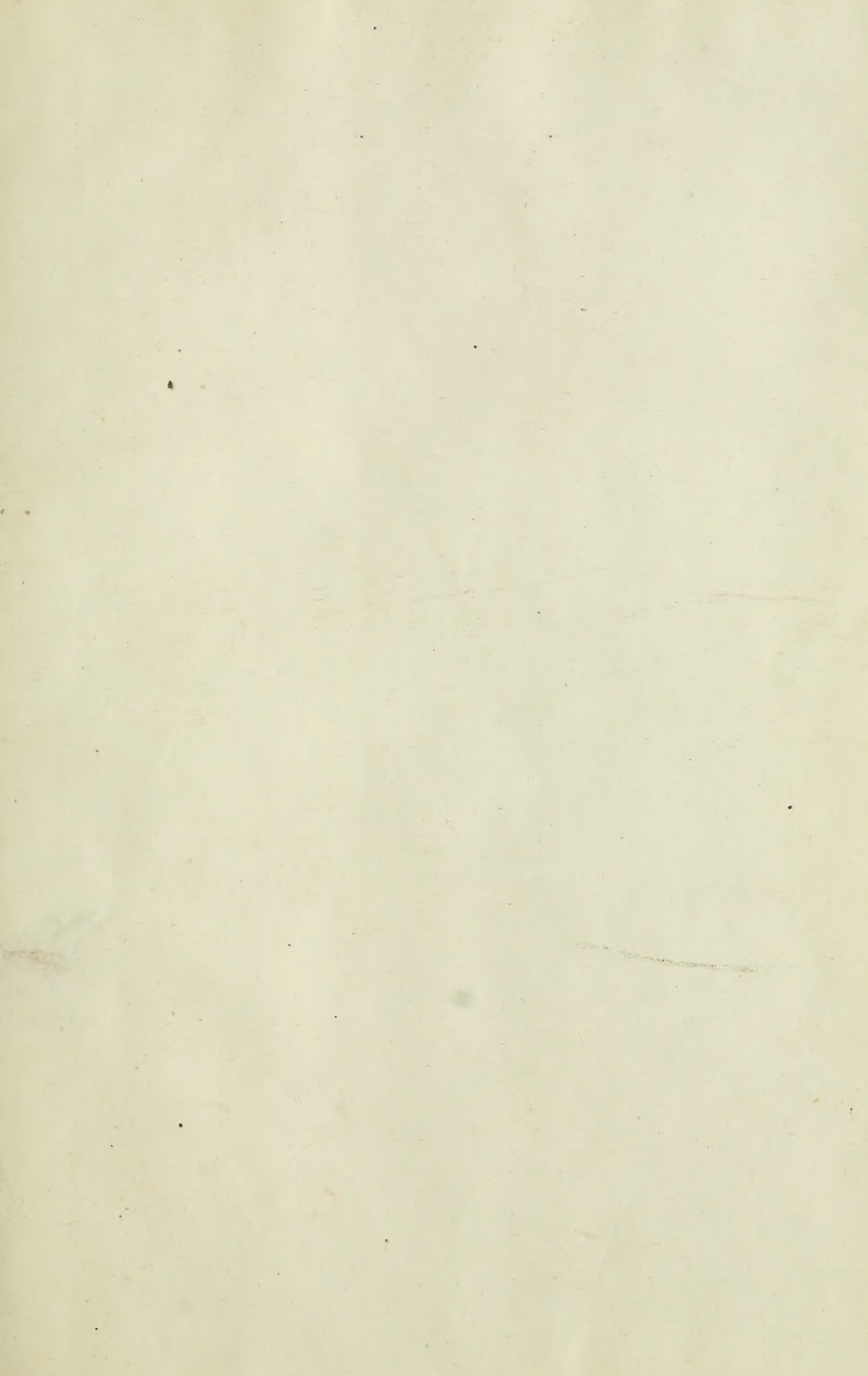
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ERRATUM.—Page 278, last line but one, for "no trace of the spots" read "no trace of *other* spots."





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